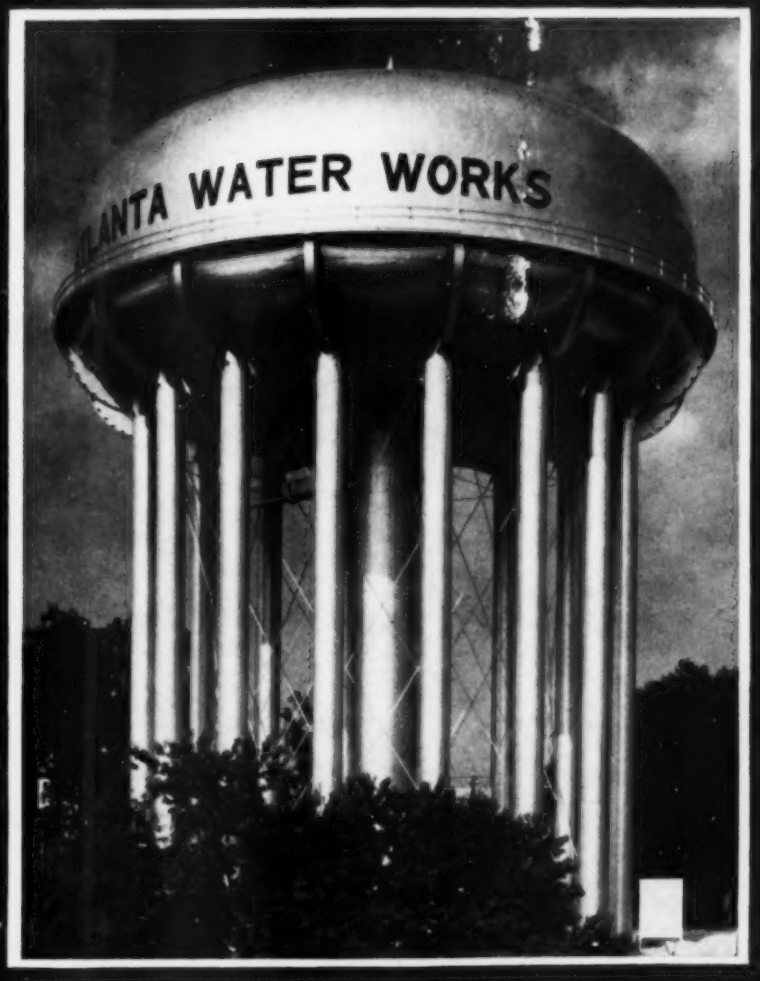
WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL



JUNE, 1952

Atlanta's Newest

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CHAPMAN

Waterworks Specialties

CHAPMAN SLUICE GATES, available up to 120" with completely interchangeable parts for every type of installation.

CHAPMAN BEAMED WATERWAY GATE VALVES, 48" diameter of opening and smaller, an exclusive Chapman development to prevent the troubles encountered with double-disc parallel-seated gate valves used under throttling conditions.

CHAPMAN AUTOMATIC CONE VALVES for check and throttling service, pressure reducing, etc., manufactured in sizes up to 48"

CHAPMAN "SDOW DISC-ARM PIVOT VALVES give simplicity, compactness and low head-loss like the regular butterfly valve . . . plus extra strength, reliability and tightness. Deflection is taken out of the lower half of the disc by applying operating force to the proper point. Available in sizes up to 96" diameter of opening.

Here's a good thing to remember: When you need the *really* big stuff . . . then you *really* can save money if you "check with CHAPMAN" *first.* For Chapman makes . . . as standards . . . many products that are specials everywhere else. For these and other "BIG ONES" in CHAPMAN's remarkable line of Waterworks Specialties, *write for full information.*

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS

New Bulletin about the HAGAN RATIO TOTALIZER

This simple and versatile control mechanism, designed by Hagan Engineers, has wide application in pneumatic control circuits which include simple or complicated computing functions.

This new bulletin about the Hagan Ratio Totalizer and what it does, is yours for the asking.

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RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTORQ FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

Hagan Corporation
Hagan Building
Pittsburgh 30, Pennsylvania

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WS-6

Safe, Simple, Economical Chlorination

HTH TABLETS and the HTH TABLET HYPOCHLORINATOR REVOLUTIONIZE CHLORINATION PRACTICE...

SAFE . . . HTH Tablets, containing 70% available chlorine, are a new form of safe, well-known Mathieson HTH. Teamed with the HTH Tablet Hypochlorinator they afford the user a dependable source of chlorine in a safe form for water treatment.

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Mathieson Chemical Corporation
Baltimore 3, Maryland

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WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

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Have Private Fire Service Charges Become a Racket? ..... Pierce Bailey
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Published Monthly—subscriptions in the U.S., Canada and Latin America $2.00 per year; Foreign $3.00. Single copies 25c.
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Why they

call this pipe

*America's No.1 Tax Saver

Top Tax Saver is the cast iron pipe in the water distribution systems of cities and towns throughout America. Beyond question, long-lived cast iron pipe has saved, and today is saving taxpayers millions of dollars. Why?

An estimated 60% of the $6-billion cumulative investment in America's water supply systems is represented by pipe and labor for the construction of supply and distribution mains, paid for usually by the issuance of bonds.

Leading waterworks engineers estimate the useful life of cast iron pipe at *4 to 5 times* the average term of a water revenue bond issue. They base their estimates on the fact that over 35 American cities have cast iron mains in service that were installed more than 100 years ago. Moreover, a survey sponsored by three waterworks associations shows that 96% of all six-inch and larger cast iron pipe *ever laid* in 25 typical cities, are still in service. Thus, the *strength factors* of long life, native to cast iron pipe, are self-evident.

When you consider that over 95% of America's water distribution systems are constructed with long-lived cast iron pipe, can you doubt that it is *America's No. 1 Tax Saver?*

America's oldest functioning water main is in its 135th year of service in Philadelphia's distribution system. Cast iron, of course. Over 30 other cities have century-old cast iron mains in service.

CAST IRON

®

CAST IRON PIPE

America's No.1 Tax Saver

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CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

MATHEWS
HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

A modern barrel makes an old Mathews Hydrant good as new

• Many a Mathews Hydrant has been in service for several generations. When the time comes to modernize, it is a simple matter to remove the old barrel and replace it with a modern one. It is unscrewed from the elbow, then withdrawn through the protection case and a new barrel inserted in its place. The job is done in a few minutes *without digging or breaking the pavement.*

Mathews Modernized Hydrants . . . Tops in Convenience and Dependability

Compression-type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • Available with mechanical-joint pipe connections

ADVANCED BADGER ENGINEERING

brings you the DOVETAIL THRUST ROLLER INSERT

Because BADGER METER engineers refuse to "rest on their laurels," they continue to maintain the world's highest standards of water meter performance. This new Badger Dovetail Thrust Roller Insert is typical of the constructive research and precision achievements in progress continually at BADGER.

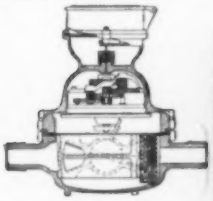
What does this Badger Dovetail Thrust Roller Insert accomplish? It saves important time and replacement costs . . . because, with this removable plate set into the chamber wall, the thrust roller (in the disc) rolls against the *insert* only . . . thus preventing wear directly in the chamber thrust roller *slot* (which would damage the chamber itself). If wear occurs on the *insert,* that is no problem, because it can be replaced easily, at a small fraction of the cost and time required to replace an entire new chamber.

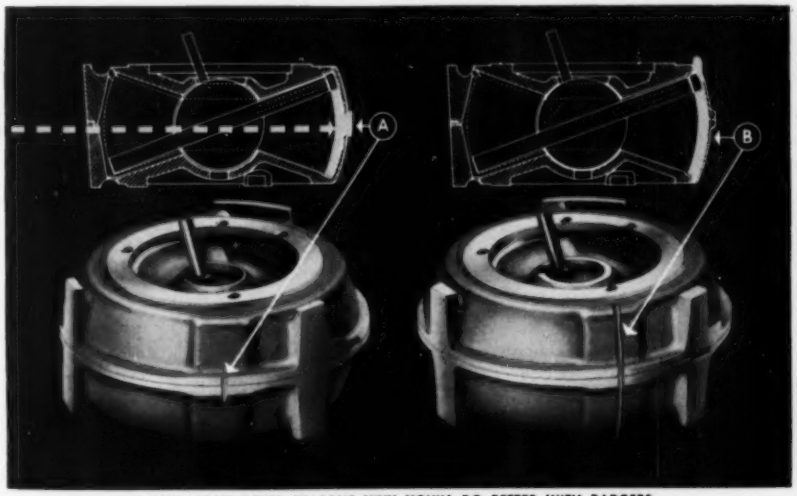
In addition, advanced Badger engineering of this unique insert assures you of accurate metering through unimpaired freedom of disc movement, because:

1. Both halves of chamber remain stronger, since this insert requires only a short slot (about 77% shorter slot milled in chamber wall).
2. Precision design and machining permit insert to be held accurately and securely in place between the two halves of the chamber.
3. The precision dovetail design prevents insert from shifting or moving.
4. The increased radius of the insert along the area nearest the disc, assures ample clearance always between disc and insert, even in the extreme allowable vertical shift.

Only in BADGER METERS will you find this advanced type of engineering and precision production which has convinced waterworks men in over 5000 communities that "BADGERS are the best buy in meters."

. . . another BADGER-First





A New style: 77% shorter slot... adds strength to chamber-halves; prevents distortion. Dovetail prevents shifting of insert. Increased radius assures freedom of disc movement. No wear on chamber; wear confined to the easily replaceable insert.

B Old style: This full length slot weakened the chamber-halves . . . made them subject to distortion.

ASK ABOUT OTHER REASONS WHY YOU'LL DO BETTER WITH BADGERS

BADGER METER MFG. CO., Milwaukee 10, Wis.

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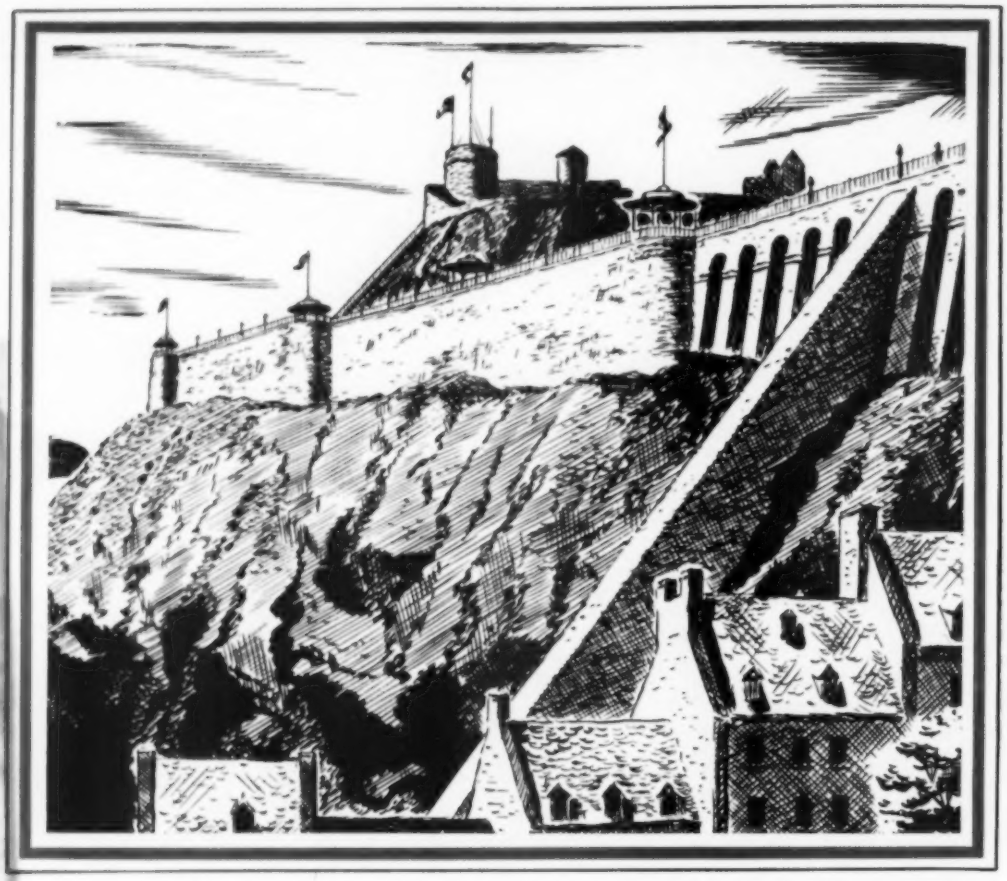
BADGER Water METERS

"MEASURING THE WATER OF THE WORLD"

FOR ACCURACY • LOW-COST MAINTENANCE • DURABILITY • SENSITIVITY



Quebec's famous Citadel, over 330 feet above the St. Lawrence, as it looked 100 years ago

Romantic Quebec has a cast iron gas main in service that was installed over a century ago. Reminiscent of those days are the horse-drawn vehicles for nostalgic tourists. Now, how could the gas engineers have foreseen the advent of trailer-trucks and giant buses, and the resultant traffic-shock? . . . That sewers and conduits for utility services would ultimately share the underground at risk of soil disturbances? Yet that gallant old cast iron main has had the necessary shock-strength and beam strength. Effective resistance to corrosion, as well as strength, are *must* factors of long life in pipe to be laid under city streets. This is shown by the fact that cast iron water and gas mains, laid over 100 years ago, are still serving in the streets of more than 30 cities in the United States and Canada.

United States Pipe and Foundry Co.,
General Offices, Burlington, N. J.
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cast iron
PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

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W&T's New Series A-635
Gravimetric Fluoridator

WALLACE & TIERNAN
COMPANY, INC.

S-76

CARLON *Plastic Pipe...*

Is Easier to Handle

Is Faster to Install

Lasts Longer

. . . **CARLON "WS"** plastic water service pipe recommended for **municipal water systems** . . . **sewage disposal** . . . **land drainage** . . . other medium-pressure applications . . . Guaranteed against rot, rust and electrolytic corrosion . . . Will not accumulate scale or sediment . . . Impervious to chemical attack of corrosive soils and waters . . . Furnished in **long lengths** . . . requires **fewer fittings** . . . **Quickly installed** without special tools . . . Can be connected with established metallic systems.

Nominal Pipe Size	O. D.	I. D.	Working Pressures P.S.I. @ 120°F.	Weight Per Foot	Normal Shipping Lengths
¾"	1.170	.824	120	.216	400' coils
1"	1.433	1.070	120	.285	300' "
1¼"	1.850	1.380	120	.477	300' "
1½"	2.260	1.610	120	.790	250' "
2"	3.000	2.070	120	1.88	200' "
2"	2.495	2.070	75	.620	200' "
2½"	2.950	2.470	75	.820	150' "
3"	3.670	3.070	75	1.280	100' "
4"	4.820	4.030	75	2.200	25' straight
6"	7.260	6.070	75	5.000	25' "

Specify the Pipe with the Stripe!

CARLON CP 532-C.P

CARLON PRODUCTS CORPORATION

IN CANADA: MICRO PLASTICS, LTD., ACTON, ONTARIO

10300 MEECH AVENUE • CLEVELAND 5, OHIO

BJ SUBMERSIBLE PUMPS

save space, reduce installation cost, and eliminate the expensive pump house eyesore

MELTING SNOW, heavy rains, and general water drainage are big problems in underpass flood control planning. This photo shows how you can meet these troublesome flood demands with new efficiency and at far less construction cost. The old standard pump house installation (at left), expensive and unattractive, can be replaced by unseen yet easily accessible BJ Submersible Pumps. These pumps are placed in a simply-constructed pit between highway lanes. They provide all the pumping capacity you need, yet use less than 1/10th the space required by a standard pump installation.

Plan your new underpass construction with BJ Submersible Pumps. And keep these space-saving pumps in your general water supply and water control program. For full details, specifications and capacities, contact your local BJ representative or send the coupon below.

BJ PUMP DIVISION, Dept. 54

Please send me full details on the BJ Submersible, including data on actual municipal installations.

NAME_____ TITLE_____

DEPT._____

CITY_____ ZONE____ STATE_____

No obligation, of course

Byron Jackson Co.
Since 1872
P.O. BOX 2017 TERMINAL ANNEX, LOS ANGELES 54, CALIF.
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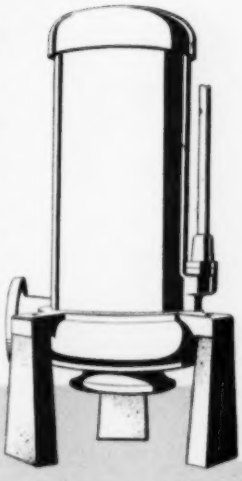
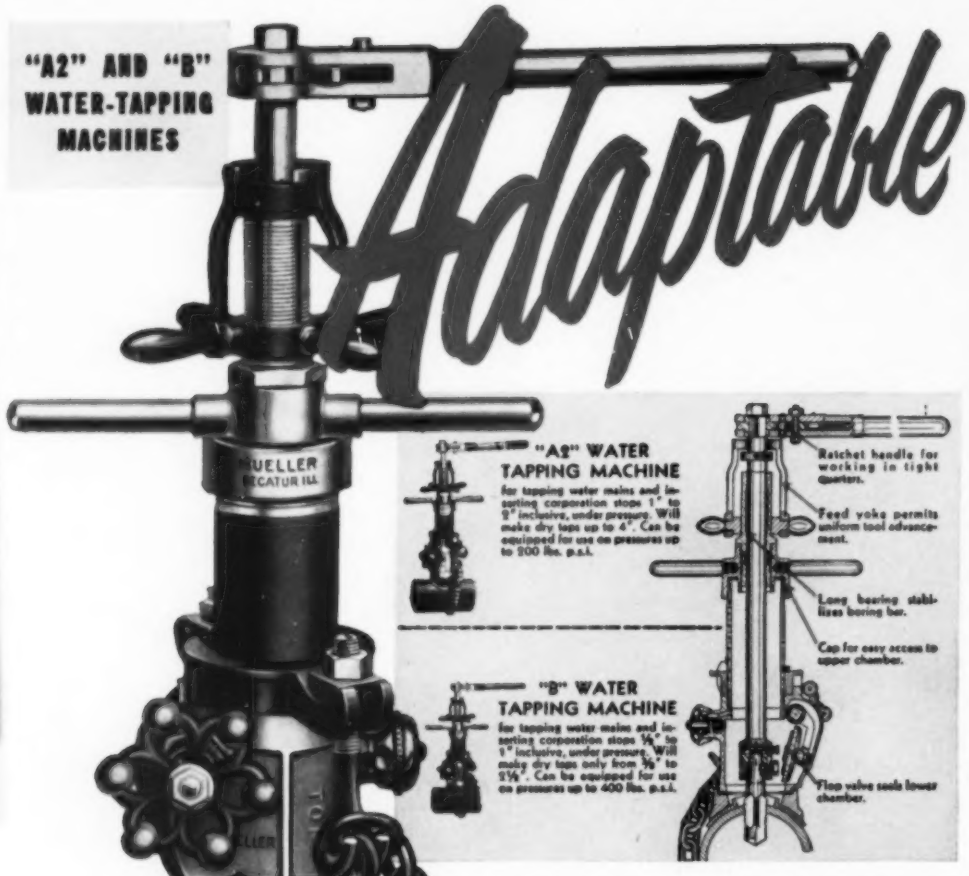


BJ Underpass Submersible with 2-part non-clogging runner.

MUELLER

"A2" AND "B" WATER-TAPPING MACHINES

Adaptable


"A2" WATER TAPPING MACHINE
for tapping water mains and inserting corporation stops 1" to 2" inclusive, under pressure. Will make dry taps up to 4". Can be equipped for use on pressures up to 200 lbs. p.s.i.
"B" WATER TAPPING MACHINE
for tapping water mains and inserting corporation stops ⅛" to 1" inclusive, under pressure. Will make dry taps only from ⅜" to 2¼". Can be equipped for use on pressures up to 400 lbs. p.s.i.
Ratchet handle for working in tight quarters.
Feed yoke permits uniform tool advancement.
Long bearing stabilizes boring bar.
Cap for easy access to upper chamber.
Flap valve seals lower chamber.

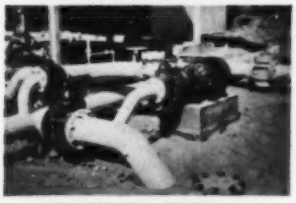
ADAPTABLE describes Mueller Water Tapping Machines! *Adaptable* for tapping mains under pressure or dry. *Adaptable* for tapping and inserting corporation stops in cast iron pipe, cement-lined cast iron pipe, asbestos-cement pipe, thin-walled steel pipe. *Adaptable* for tapping Mueller or Iron Pipe thread holes and inserting stops in the full range of sizes from ½" to 2". *Adaptable* for working on mains ranging from 2" to 48". For more information write for Catalog H or see your Mueller representative.

MUELLER CO.

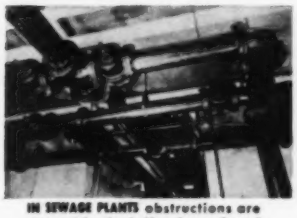
Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

IN CHEMICAL PLANTS a.c.f. "full pipe area" valves offer no obstruction... full flow for abrasives, suspensions.



IN THE PETROLEUM INDUSTRY where seconds count in loading and unloading a.c.f. Valves give fastest possible flow.



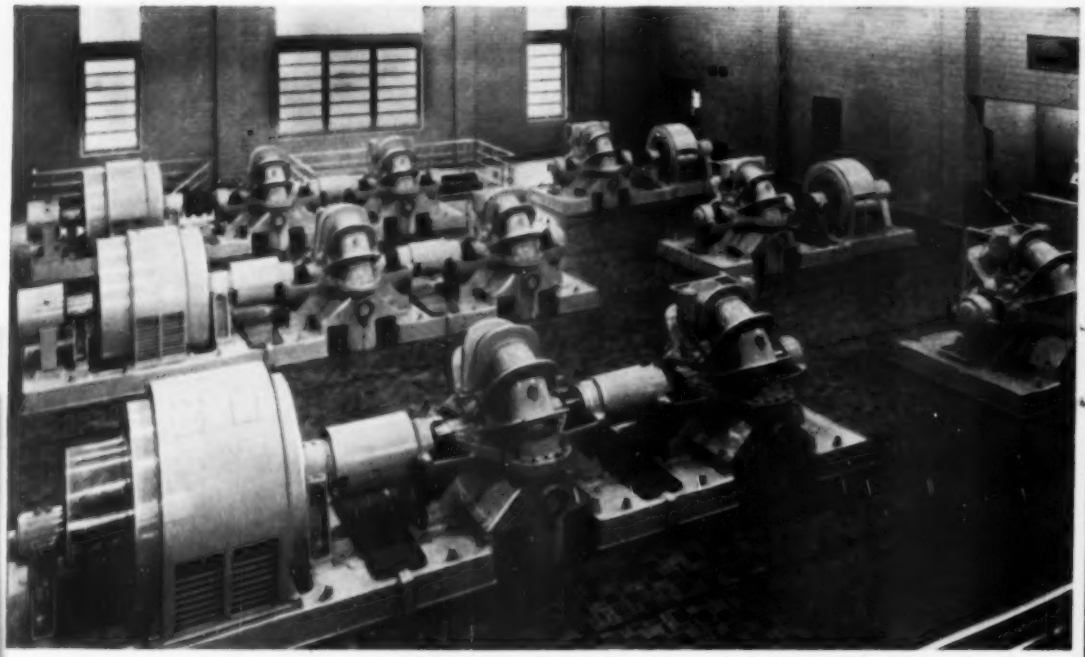
IN SEWAGE PLANTS obstructions are sheared by the knife-edge action of the a.c.f. CYLINDRICAL Plug.

a.c.f. CYLINDRICAL Lubricated Plug Valves have no wedging effect. This plus the quick, quarter-turn shut-off feature gives you safe, sure, split-second control even at capacity flow. Made to last, a.c.f. Valve bearing surfaces are lubricant sealed. Substantial reasons for the absolute leadership of Full Pipe Area a.c.f. Valves.

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalogue 4-WS, American Car and Foundry Co., Valve Division, 1501 E. Ferry Ave., Detroit 11, Mich.

Representatives in 50 Principal Cities



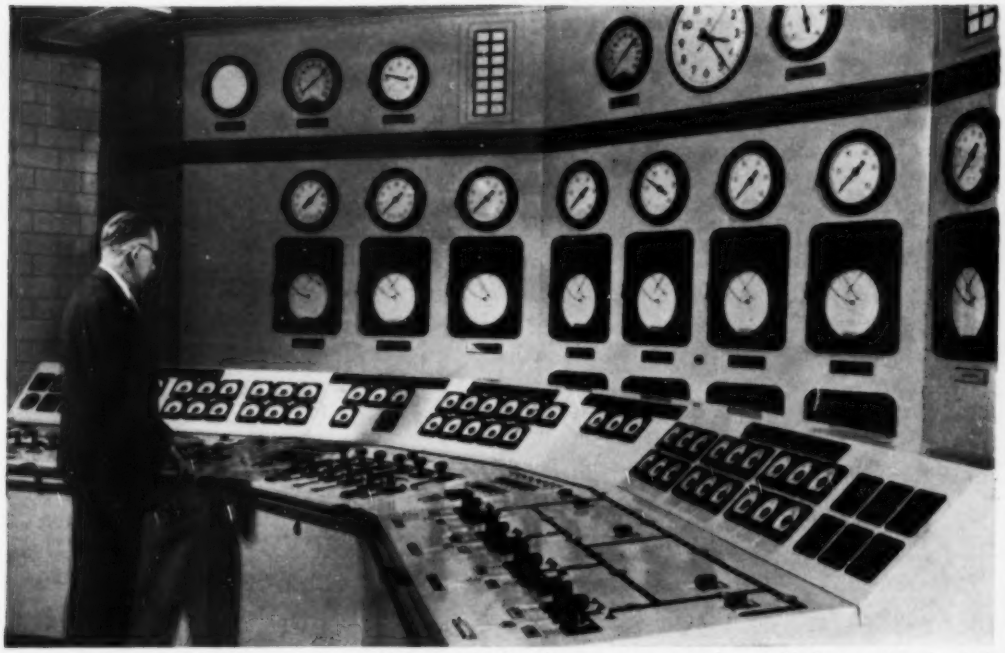
In main pump room, six G-E synchronous and wound-rotor motors ranging from 1250 to 3000 hp drive Worthington centrifugal pumps supplying city's two distribution grids. Space is available for two more pumps to increase station capacity to 200 mgd. Black and Veatch were consulting engineers for water works expansion which includes Tennyson Station.

Cincinnati doubles

Incoming power to Tennyson Station, supplied by Cincinnati Gas and Electric Co., is stepped down by these three G-E power transformers to 4160 volts to supply pump motors.

Pump motor power is controlled by G-E switchgear at right. Two G-E dry-type unit substations on left transform high-voltage power to 208Y 120 volts for lighting and control use.

CO-ORDINATED WATER-PLANT ELECTRIFICATION



Nerve center of new station is this central control benchboard. Versatile G-E SB-1 switches at front of panel are used to control pump motors and valves, while easy-to-read G-E switchboard instruments on slanting panel indicate station electrical values. Pump discharge readings at Main Station are telemetered to this board by G-E equipment.

its water facilities

New G-E equipped Tennyson Station matches existing system capacity to provide more water for tomorrow

G-E supervisory control indicates system operating conditions at a glance.

As part of a five-year modernization and expansion program, the Cincinnati Water Works System recently placed in operation its new all-electric Tennyson Pumping Station. Motors, control, and power distribution equipment were supplied by General Electric. More than that, G-E engineers, working closely with the city's consultants, helped fit these components into a *co-ordinated* electrical system tailored to station requirements.

By matching the output of the existing Main Pumping Station, the new plant brings the system's capacity to 300 mgd, providing abundant water for Cincinnati's growing needs. Moreover, the new station will relieve the overburdened Main Station, assuring greater reliability of service and making possible the systematic modernization of this facility.

As it has helped Cincinnati and dozens of other cities, General Electric can help *you*, too. G-E engineers are ready to work with your consultants in developing a co-ordinated electrical system for your water-supply facilities. Contact your G-E apparatus representative *early in the planning stage*, when he can help most.

STIMULATE YOUR COMMUNITY'S INTEREST IN WATER SUPPLY by showing the new color movie "Pipeline to the Clouds." It's part of General Electric's MORE POWER TO AMERICA Water Supply Program. Write for details on your letterhead to *General Electric Co., Section 666-70, Schenectady 5, N. Y.*

GENERAL ELECTRIC

is the REX® TOW-BRO way to improved sludge removal

Gentle suction rather than conventional plowing or scraping—that's the Tow-Bro principle that means more efficient sludge removal. Rex engineers developed the Tow-Bro particularly for handling light, flocculent solids where *a minimum of agitation, high solids concentration* and *rapid sludge removal* are factors vital to good performance.

Tow-Bro's *gentle suction* gives these important advantages:

1. Clearer Effluent . . . less disturbance assures a better settling condition and hence clearer effluent.

2. Greater Solids Concentration . . . Tow-Bro principle assures much higher solids concentration than is obtainable with conventional scraper-type mechanisms.

3. Low Cost . . . no sludge hopper or center pier required. Greater solids concentration means less tank volume, smaller piping, less pumping.

4. Prevents Septicity . . . sludge has less chance to become septic because all sludge is removed at one revolution. Sludge is in the settling tank a shorter time.

5. Greater Operating Flexibility . . . varying rate of sludge draw-off over wide range as possible without diluting vortex action provides greater operating flexibility.

6. Easy Adaptation . . . Tow-Bro is easily adapted to round, square or rectangular tanks . . . new or existing.

Get all the facts. Call your nearest Rex District Office or write for Bulletin 51-83. Chain Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wis.

Chain Belt COMPANY OF MILWAUKEE

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NORTH POINT PLANT

Second of San Francisco's three new sewage treatment units goes into operation

The new North Point sewage disposal plant is the latest addition to San Francisco's three plant sewage treatment program. It began a thirty day test run on October first and provides primary treatment for a design flow of 60 million gallons of sewage per day.

The North Point plant covers eight acres. There are 10 digesters, each 100 ft. in diameter and 33 ft. high with steel floating covers. These are arranged in groups of five — each group consisting of three primary digesters and two secondary digesters. The remaining tank is a 56-ft. in. diam. by 20-ft gasholder.

The North Point plant was designed by the engineering office of Clyde C. Kennedy, Consulting Engineers of San Francisco.

Ten digestion tanks with P.F.T. Floating Covers and a gasholder with a P.F.T. spirally guided cover built by Chicago Bridge & Iron Company for San Francisco's North Point sludge treatment plant.

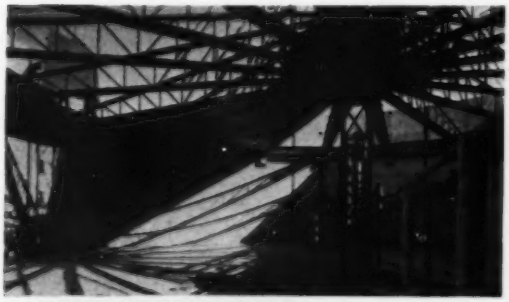
Keeping Sewage Out of San Francisco Bay

San Francisco's new $4,486,000 North Point sludge treatment plant is the biggest unit of a $20,000,000 program designed to prevent dumping raw and dangerous sewage into bay waters. It substantially augments existing sewage treatment facilities by serving sixty per cent of the city.

Playing an important part in the operation of the North Point plant are ten 100-ft. diameter digestion tanks equipped with P.F.T. Floating Covers, a 55-ft. 6-in. diameter gasholder with a P.F.T. spirally guided cover and a 15,000-gal. Horton elevated water tank. All these structures were fabricated and erected by Chicago Bridge & Iron Company.

Gas formed in the sludge digestion process is collected in the digestion tanks at a pressure of 5 inches of water. It is then metered and piped to the gasholder where moisture is precipitated and the supply to the compressor is equalized for distribution to the mains.

Floating covers, spirally guided covers and elevated tanks are only a few of the many types of steel plate work we do. Write our nearest office for information.



Interior view of 100-ft. diameter digestion tank at San Francisco's North Point sludge treatment plant showing erection of P.F.T. Floating Cover by a Chicago Bridge & Iron Company field crew. Radial trusses are all in place. Steel plates are being welded into the fourth bay.

HORTON

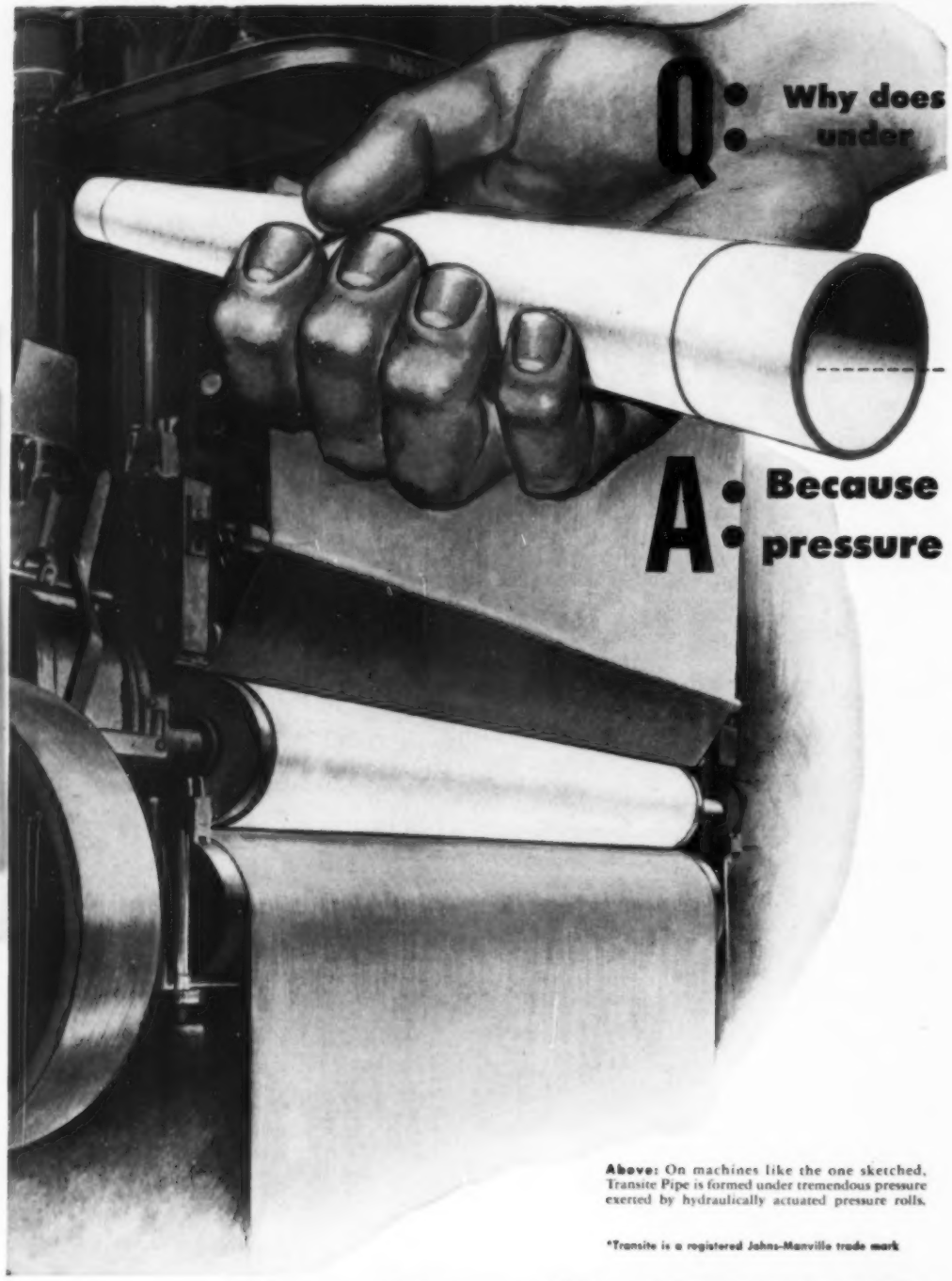
WELDED STEEL

STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3	2181 Healey Building	Los Angeles 17	1555 General Petroleum Building
Birmingham 1	1586 North Fiftieth Street	New York 6	3390—165 Broadway Building
Boston 10	1040—201 Devonshire Street	Philadelphia 3	1644—1700 Walnut Street Building
Chicago 4	2198 McCormick Building	San Francisco 11	1583-200 Bush Street
Cleveland 15	2262 Guildhall Building	Seattle 1	1350 Henry Building
Detroit 26	1551 Lafayette Building	Tulsa 3	1646 Hunt Building
Houston 2	2115 C & I Life Building	Washington 6, D.C.	1109 Cafritz Building



Above: On machines like the one sketched, Transite Pipe is formed under tremendous pressure exerted by hydraulically actuated pressure rolls.

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE

TRANSITE PIPE last longer these Texas city streets?

The water system in this fast-growing Texas city is a tribute to the lasting strength and corrosion resistance that enable Transite Pipe installations to outlast other pipe under busy city streets. The first Transite mains were installed here in 1939 to replace previously used pipe which had a service life of approximately seven years. So successful was this original installation that today, virtually the entire supply and distribution system consists of Transite mains.

it's formed under tremendous for lasting strength

Tough, strong asbestos fibers reinforce Transite Pipe—contribute to its exceptional corrosion resistance and lasting strength.

Yes, it's the all-important quality of *lasting strength* that enables Transite* Pressure Pipe to stand up under conditions highly adverse to ordinary pipe—as typified by the Texas city installation shown in the photograph above.

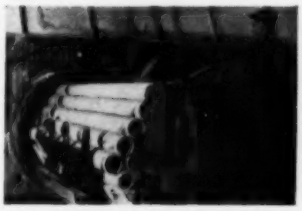
One of the reasons why Transite Pipe has this exceptional ability is the process used in its manufacture.

On specially designed pipe-forming machines, the materials that go into its making—asbestos, cement and silica . . . are consolidated under heavy pressure into a tough, dense homogeneous pipe wall structure. And reinforcing this structure . . . distributed uniformly throughout each length of pipe . . . are countless indestructible fibers of asbestos with a tensile strength comparable to that of steel. *No wonder this modern asbestos-cement pipe is strong and stays strong through the years!*

And no wonder thousands of American cities and towns have found it the answer to today's need for a pipe that assures the greatest possible return on waterline investments. For in addition to those economies resulting from lasting strength, Transite Pipe also provides other important savings. Its light weight and easy handling reduce installation costs. Its tight, flexible Simplex Couplings cut down on costly leakage losses. Its smooth interior assures a high coefficient of flow (C=140) and, because Transite cannot tuberculate, helps keep pumping costs permanently low through the years.

May we send you all the facts? Brochure TR-11A will bring them to you free. Address Johns-Manville, Box 60, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS



The pressure steam curing process—another reason why Transite Pipe survives corrosive attack and stays strong in service.

Transite's tight, flexible Simplex Couplings help relieve the line of excessive flexural stresses and safeguard against leakage and resulting undermining effects on water mains.

asbestos-cement PRESSURE PIPE

It doesn't take specialized training or skill to join pipe with Dresser Couplings. Ordinary workmen can make permanent, flexible joints every time.

Why? Because Dressers come to the job ready to use, with the skill already built in. Parts are few and accurate. Assembly is simple and fast. Leakproof joints are assured because Dressers provide controlled gasket pressure through controlled bolt tightness around the joint.

And with long sections of steel pipe, there are fewer joints to make, lines are completed and in service sooner.

A Dresser-Coupled steel line has lifelong resilience. Absorbs stresses of expansion, contraction and vibration that cause so much trouble for rigid or caulked lines. Dressers save man-hours on installation and maintenance, too.

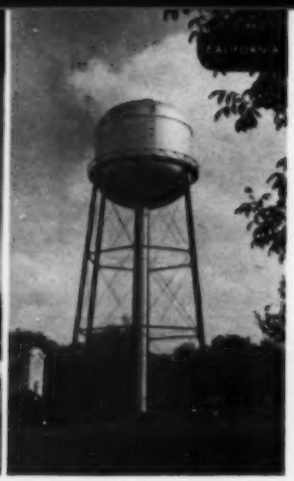
DRESSER

"FLEXIBLE-TIGHT"

COUPLINGS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California. Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: 629 Adelaide Street, W., Toronto, Ontario

Dresser Couplings come in sizes ⅜" to 72" and larger. Ask your Dresser Sales Engineer for latest data and follow-through service, or write to our main office.



Favorites

DOUBLE-ELLIPSOIDAL DESIGN

ELEVATED STEEL TANKS

by

PITTSBURGH-DES MOINES

Excellence of design combines sound economy with tasteful appearance in our popular Double-Ellipsoidal Elevated Steel Tanks, which are available in a wide range of capacities. For full information on this and other types of PDM Elevated Steel Tanks for modern water storage, request our latest 20-page descriptive brochure.

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH (25)	3418 Neville Island	DES MOINES (8)	919 Tuttle Street
NEWARK (2)	218 Industrial Office Bldg.	DALLAS (1)	1223 Praetorian Building
CHICAGO (3)	1222 First National Bank Bldg.	SEATTLE	526 Lane Street
LOS ANGELES (48)	6399 Wilshire Blvd.	SANTA CLARA, CAL.	625 Alviso Road

Two Eimco Vacuum Filters and dried sludge conveyor installed in Waterbury, Conn., Sewage Plant. Construction directed by City Engineer Henry C. Whitlock, supervised by Sanitary Engineer and Plant Superintendent Walter M. Kunsch.

NEW SEWAGE PLANT DEWATERS SLUDGE

—and Everdur is chosen for the Eimco Vacuum Filters that do the job

When Malcolm Pirnie, consulting engineer of New York, designed the new sewage treatment plant for Waterbury, Conn., he took into consideration the nature of the influent which was domestic sewage mixed with industrial wastes. Vacuum filtration and incineration were advised.

Eimco Corporation, of Salt Lake City, Utah, supplied the two vacuum filters. They are of the continuous rotary type, equipped with a standard swing agitator. Eimco had to consider the effect of the varying agents of corrosion in the raw sewage upon the metal components of these filters. Everdur* (ANACONDA Copper Silicon Alloys) was a logical choice to resist the corrosive action of the sludge effluent. In the Eimco filters all woven wire screens (5 x 5 mesh x .063" gage), division strips, bolts, nails and screws were made of Everdur.

Great strength, high corrosion resistance, good working and welding properties have recommended the use of Everdur as a reliable, durable alloy in sewage and waterwork installations for a quarter century. In handling industrial wastes, corrosion problems are particularly complicated. For the proper Everdur Alloy, we suggest that you take advantage of the services of our Technical Department. Write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

*Reg. U. S. Pat. Off.

★ ★ ★

EVERDUR *is ideal for wrought assemblies such as gates, screens, float chambers, weirs, troughs, manhole steps, gate guides, stems and bolts.*

specify **EVERDUR**— **ANACONDA®** **COPPER SILICON ALLOYS**

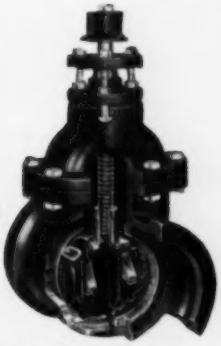
Strong—
Weldable—
Workable—
Corrosion-Resistant—

IOWA products

meet your most exacting specification

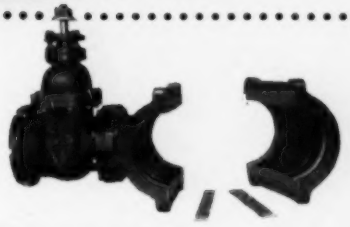
Superiority of Design, Workmanship, and Materials Assures Efficient Trouble Free Operation . . .

In every job



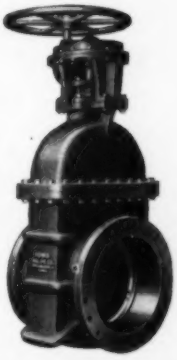
IOWA GATE VALVES—Simple, rugged construction, fully bronze mounted. Parallel seat, double disc type with independent solid bronze wedges and stem nut. Trouble free service assured.

IOWA CHECK VALVES—Balanced swing type, bronze trimmed throughout. Equipped with stainless steel hinge pin. Furnished with rubber or leather faced disc if desired. For installation in either horizontal or vertical pipe lines. Extremely low loss of head.



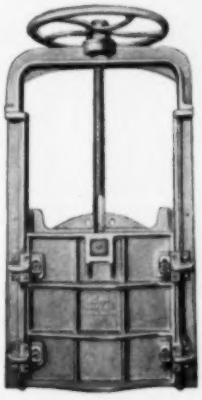
IOWA TAPPING SLEEVES and VALVES—Sturdily built, easy to assemble and center on pipe. All bolted type with lead strips for tight sleeve connections. Extra long body sleeves with heavy flanges amply protect the cut. All sizes available.

IOWA FIRE HYDRANTS—Latest Corey type conforming to AWWA specifications. Will not geyser when standpipe is broken. Unique design provides unrestricted water flow with extreme low loss of head.



IOWA SQUARE BOTTOM VALVES—Specially designed for throttling service in filter wash and pump discharge lines. Square bottom features can be built into gate valves of any pressure ratings.

IOWA HYDRAULIC VALVES—Superiority of design matched with sturdy construction meets severe, continuous filter service requirements. Available with either iron, brass lined or brass tubing cylinders.



IOWA SLUICE GATES—Heavy cast iron construction, fully bronze mounted. Provided with solid bronze adjustable wedges. Suitable for seating and unseating pressures. Wide range of sizes.

Write today for descriptive literature.

IOWA VALVE COMPANY

201-299 N. Talman Ave., Chicago 80, Ill. • *A Subsidiary of James B. Clow & Sons*

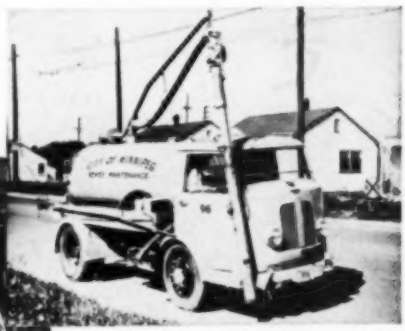
Sewer Maintenance Easy and Economical!

This Karrier Catch Basin Cleaner is used by Sanitary Engineering Company, N. Falmouth, Massachusetts for contract cesspool cleaning.

Any municipality that has sewer maintenance problems will agree that the Karrier Catch Basin Cleaner is the answer to their problem for these reasons:

1. Short wheel base for maneuverability; small turning circle.
2. Quiet and slow-running vacuum pump.
3. Hydraulic ram separates solids from dirty water thus increasing the effective capacity of the storage tank.
4. Subdivided tank with compartments for water and sludge.
5. Counterbalanced suction pipe swings to either side or to rear of vehicle.
6. Dirty water can be returned to sewer or used for flushing the next catch basin.
7. Hydraulic ram discharges load from door at the end of the tank when storage space is filled.

Another enthusiastic user of Karrier equipment for sewer maintenance is the City of Vancouver.



Top: For sewer maintenance the City of Winnipeg uses this equipment.

Left: City of Toronto is one of more than 750 municipalities using the Karrier Catch Basin Cleaner.

KARRIER

Catch Basin Cleaner vacuums the dirt out

FOR FULL DETAILS WRITE TO:

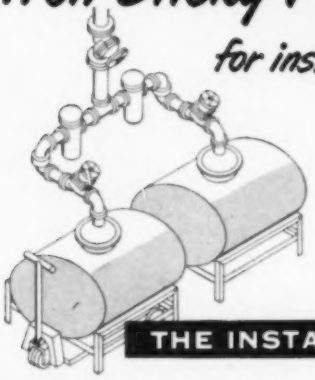
ROOTES MOTORS INC.

27-11 Bridge Plaza North, Long Island City 1, New York (STillwell 6-2305)

INCORPORATING OVER 30 YEARS OF MECHANICAL CATCH BASIN EXPERIENCE.

Do Your Valves Fit Your Job This Well?

... on Sticky Fluid for instance



THE INSTALLATION

Crane Diaphragm Valves on air pressurized liquid latex piping service in paint factory, Adams & Elting Division, The Glidden Company, Chicago.

THE HISTORY

Conventional valves formerly used in this service were hindered by exposure of working parts to the line fluid. The sticky latex would accumulate in the bonnet and stem threads, freezing the stem, and making valve operation difficult or impossible. With 10 or more operating cycles required daily, the plant faced considerable valve trouble and maintenance expense.

Both trouble and maintenance cost were completely eliminated by replacing with Crane Diaphragm Valves. Their fully sealed bonnet keeps the latex out of working parts. They operate smoothly and do not freeze or stick. So well is the customer satisfied with Crane Diaphragm Valves, more have been ordered for new latex lines.

VALVE SERVICE RATINGS

OPERATION:	Easy - No sticking
SUITABILITY:	Fluid can't get into bonnet
MAINTENANCE COST:	None to date - None indicated
SERVICE LIFE:	No sign of wear
OPERATING RESULTS:	Production delays stopped
PRICE:	In line - No premium
AVAILABILITY:	Stock item in Crane line

THE VALVE

Crane No. 1610 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. Neoprene diaphragm acts as bonnet seal only; isn't pinched or stressed when valve is closed. Conventional type seating makes positive closure even should diaphragm fail. High flow capacity Y-pattern body has non-restricting interior design. Available unlined or fully Neoprene lined. Consult your Crane Catalog or Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

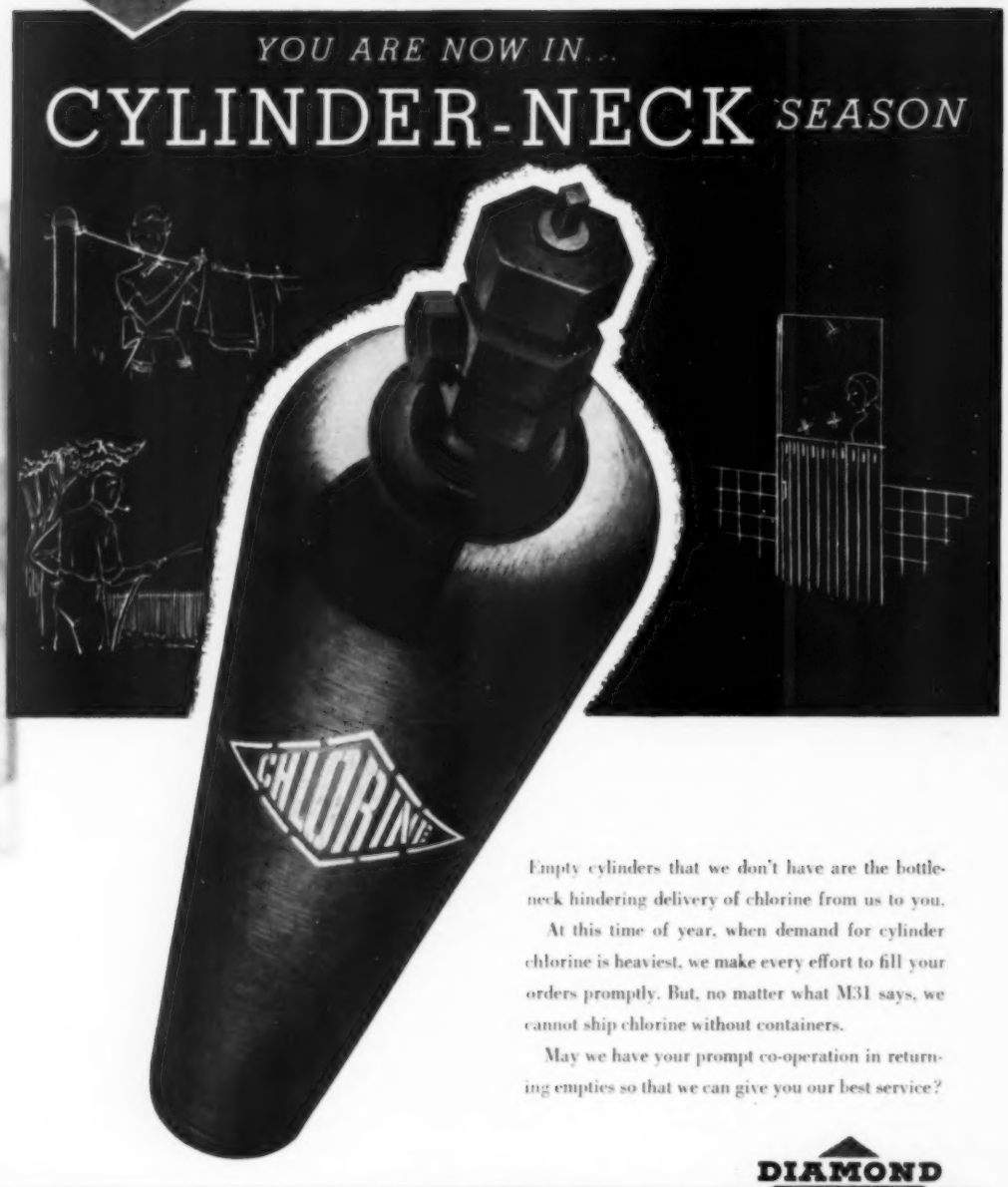
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Chemicals you live by

YOU ARE NOW IN...

CYLINDER-NECK *SEASON*



Empty cylinders that we don't have are the bottle-neck hindering delivery of chlorine from us to you.

At this time of year, when demand for cylinder chlorine is heaviest, we make every effort to fill your orders promptly. But, no matter what M31 says, we cannot ship chlorine without containers.

May we have your prompt co-operation in returning empties so that we can give you our best service?

CHLORINE DEPARTMENT

DIAMOND ALKALI COMPANY...CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS ®

Smoothest operating and best by far

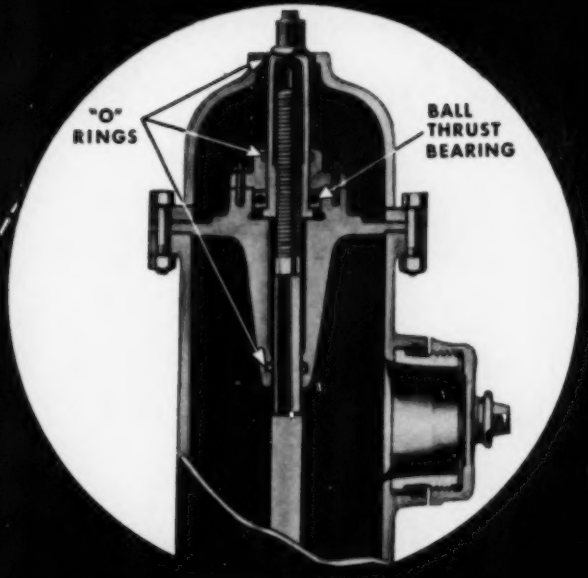


Photo above shows modern, clean-cut design of new Darling B-50-B fire hydrant. As in any Darling hydrant all *inside working parts, including main valve and drain valve parts, can be removed through the top for easy inspection and simplified maintenance.*

DARLING
B-50-B FIRE HYDRANT

THE Darling B-50-B fire hydrant, rated a major advance in hydrant design, eliminates the very things that often lead to unexpected trouble and failure in hydrant operation.

Note that it is *ball bearing* operated, for the smoothest, *surest* action ever! Opening and closing actually takes less than half the usual wrench torque!

Note, also, how the B-50-B design uses "O" ring seals, dispensing with the usual stuffing box, and resulting in a *dry top* hydrant! Moreover, these "O" ring seals not only prevent the loss of thread and bearing lubricant, but never let a drop of water reach the operating threads.

In short, the revolutionary B-50-B not only does away with much bothersome servicing such as gland adjustment, lubrication and packing replacement, but assures fast, easy operation when you need it most!

Before you decide on *any* hydrant, be sure to weigh *all* the advantages of Darling's B-50-B hydrant.

Send for Bulletin No. 5007

DARLING VALVE & MANUFACTURING CO.

Williamsport 11, Pa.

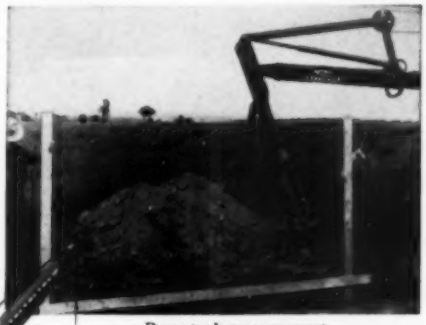
HYDROHOE Cuts Trenching Move-Up Time by 40%

With the smooth extend-retract action of its telescoping boom, the fully hydraulic Bucyrus-Erie Hydrohoe cuts move-up time on trenching as much as 40 percent. Operator begins cut with boom extended to full "out" position. As he trenches he retracts boom, digging right up to the back of truck. This dragshovel earns extra dollars digging, while conventional units are moving up.

After digging a length of trench, operator can peel off the last few inches at grade level — smooth out the scallops, by merely telescoping boom. In addition, ability to retract boom makes the Hydrohoe extra compact for work in close quarters.

These are only a few of the many Hydrohoe advantages. For complete details write us or see your Bucyrus-Erie Hydrocrane distributor. He will be happy to arrange a demonstration. 162H52

The new Bucyrus-Erie Hydrohoe gives you not one, but two digging actions: 1. Conventional dragshovel digging arc. 2. A separate horizontal action by means of telescoping the boom.



By actual measurement this Hydrohoe, digging at an approximate depth of 4 ft., cuts an 11-ft. long trench — without a single move-up.

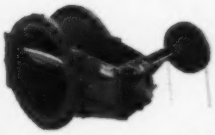
BUCYRUS ERIE HYDROCRANE

• From Hydrohoe to Hydrocrane—right in the field—only three hours. This quick convertibility increases the on-the-spot value of the Hydrocrane's many attachments—hydraulically operated clamshell bucket, ½-yd. materials handling bucket, 1-yd. snow and trash bucket, catch basin bucket, grapple, magnet and cranehook.

BUCYRUS-ERIE HYDROCRANE DIVISION
South Milwaukee, Wisconsin

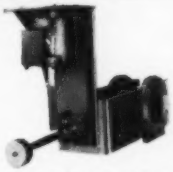
R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



WATER SERVICE—No. 82[X]—36-inch 125-pound cast iron valve equipped with 18—8 shafts, bronze bushings and rubber seat for 85-pound drip tight shut-off.

EMERGENCY OIL SERVICE—No. 628—solenoid trip valve. Should the solenoid function, the latch is tripped which causes the counter-weight to open or close the valve by gravity. Available in any metal or alloy and in various sizes for emergency shut-off or vent for air, gas, steam, oil, and water.



700° F. EXHAUST GAS SERVICE—No. 826—6-inch 125-pound R-S "H" metal valve used on small turbine generator. Equipped with 18—8 shafts, hastelloy bushings, finned lubricated stuffing box and solenoid trip mechanism.

STEAM SERVICE—No. 677—1500-pound welding end steel valve for superheated steam—A. S. M. E. Standards.

SEMI-SOLID SERVICE including abrasive and corrosive materials.

R-S VALVES
Control and Shut Off Practically Any Material

The beveled vane seats firmly at a 12½° angle and is closed from a fully open position through 77½° of arc by either manual or automatic operation. A metal-to-metal seat gives satisfactory commercial shut-off. When required, Monel or stainless steel can be welded to the vane periphery and a babbitted seat used in the valve body. Drip tight or bubble tight closure can be obtained with a rubber seat.

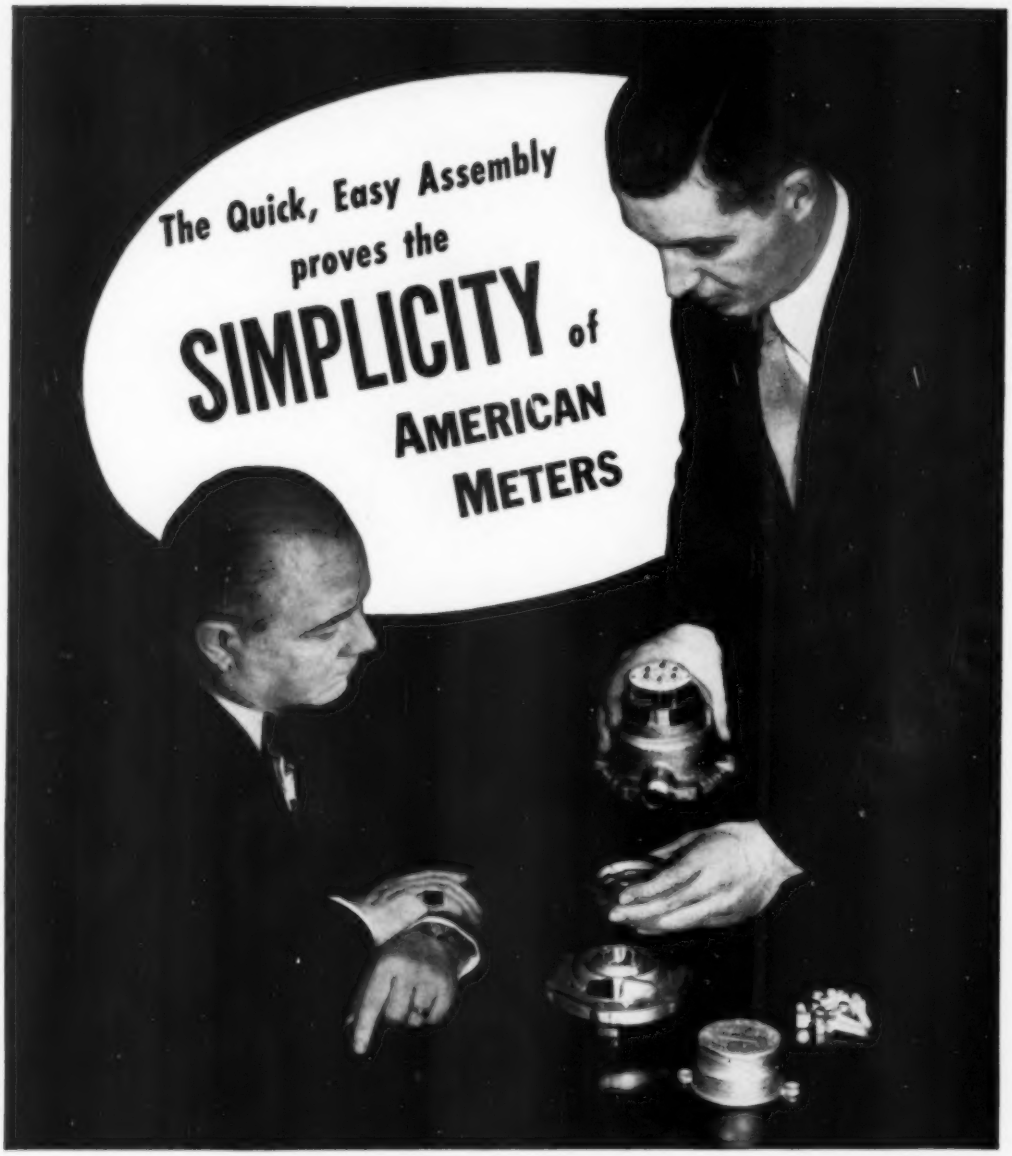
Power controlled prime movers delivering the necessary foot pounds of torque open or close these self-cleaning valves at any desired speed from one second to eight minutes according to requirements. Pressures range from 2 to 2500 psig and temperatures from minus 300° F. to plus 2000° F.

Such simplicity of design, adaptability and operating ease are the reasons why R-S Valves can be installed to control and shut off the volume and pressure of any material that flows or is forced through a pipe.

Obtain full details from your R-S representative.

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.
An S. Morgan Smith Company Subsidiary

DISTRICT OFFICES IN PRINCIPAL CITIES



• Quick dismantling — quick re-assembly —is possible whenever repairs are needed. American Meter parts are interchangeable but you can't assemble them the wrong way. You work right side up and can see as you place the parts in position. Earning time is increased, shop time is reduced to a minimum.

BUFFALO METER CO.

Ask for complete data.

2909 MAIN STREET, BUFFALO 14, NEW YORK

Take Your Pick of Performance

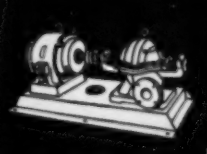
In the complete Fairbanks-Morse Pump Line you can pick the pump that best suits your ideas of performance, efficiency, capacity, head, initial and operating costs. Whatever your choice, you can be sure it will more than live up to your expectations . . . it's Fairbanks-Morse.

For complete information, call your Fairbanks-Morse pump expert or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE,

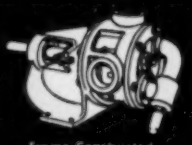
a name worth remembering

PUMPS • DIESEL LOCOMOTIVES AND ENGINES
ELECTRICAL MACHINERY • SCALES • HOME WATER SERVICE EQUIPMENT
RAIL CARS • FARM MACHINERY • MAGNETOS

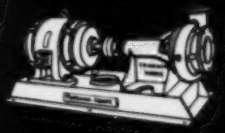


Two-Stage Centrifugal Pumps
Capacities: 100-560 G.P.M.

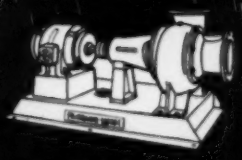
Builtogether
Centrifugal Pumps
Capacities: 5-1000 G.P.M.



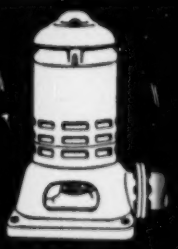
Frame Constructed
Rotary Pumps
Capacities: 1.3-450 G.P.M.



Base-Mounted Centrifugal Pumps
Capacities: 25-3000 G.P.M.

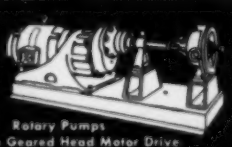


Horizontal Angle Flow Pumps
Capacities up to 100,000 G.P.M.

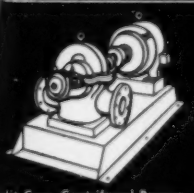


Deep Well Turbine Pumps
Capacities: 15-25,000 G.P.M.

Paper Stock Pumps
Capacities up to
2500 G.P.M.

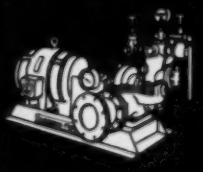


Rotary Pumps
With Geared Head Motor Drive
Capacities: 20-450 G.P.M.



Split-Case Centrifugal Pumps
Capacities: 50-50,000 G.P.M.

Two-Stage Builtogether Pumps
Capacities: 5-1000 G.P.M.

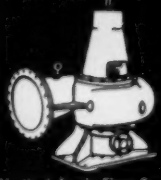


Centrifugal Fire Pumps
Capacities: 500-2000 G.P.M.

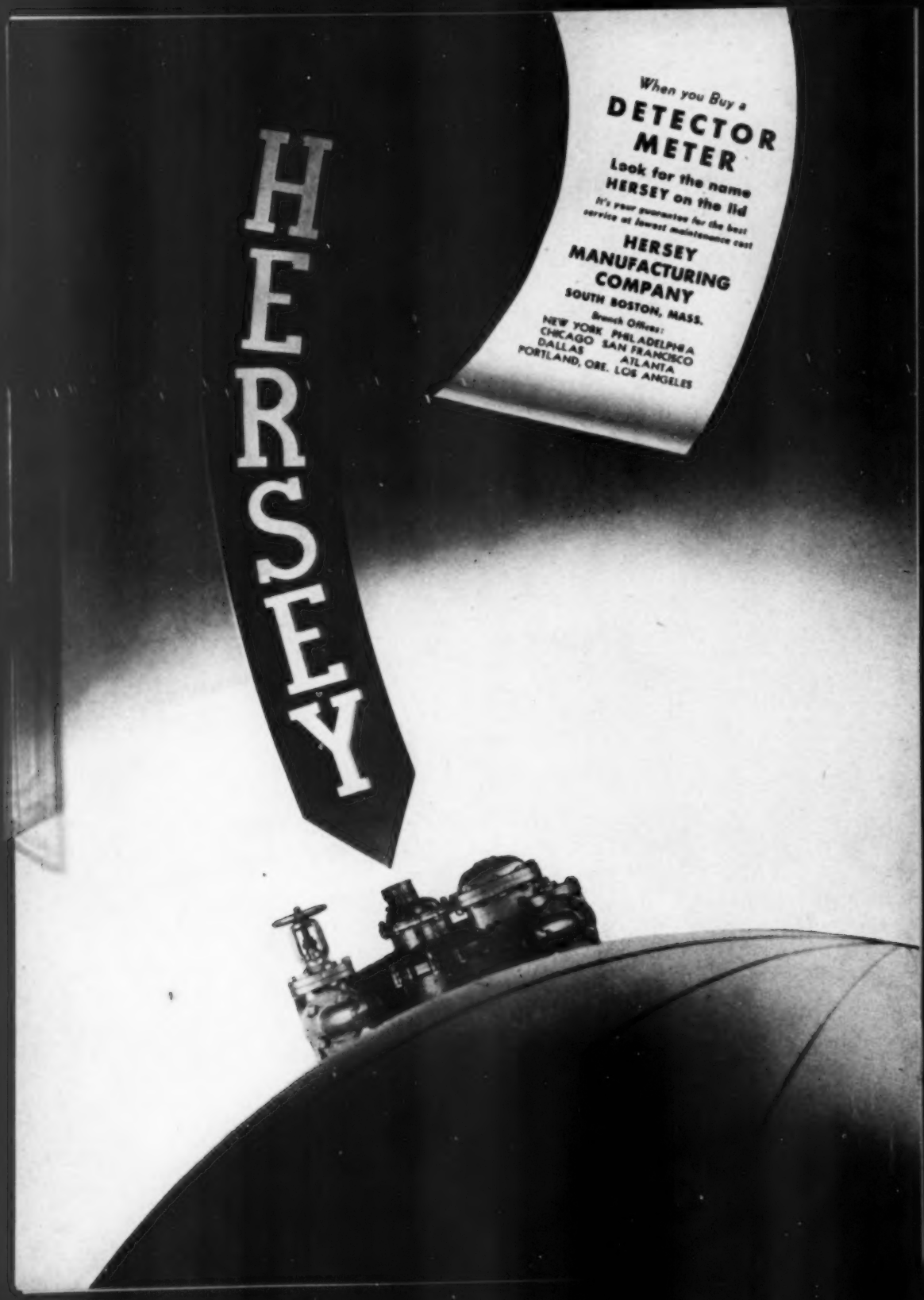
Bladeless Impeller
Food Handling Pumps

Vertical
Propeller Pumps
Capacities:
1250-216,000
G.P.M.

Sewage and Trash Pumps
Capacities: 50-20,000 G.P.M.



Vertical Angle Flow Pumps
Capacities up to
100,000 G.P.M.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It's your guarantee for the best service at lowest maintenance cost
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DALLAS ATLANTA
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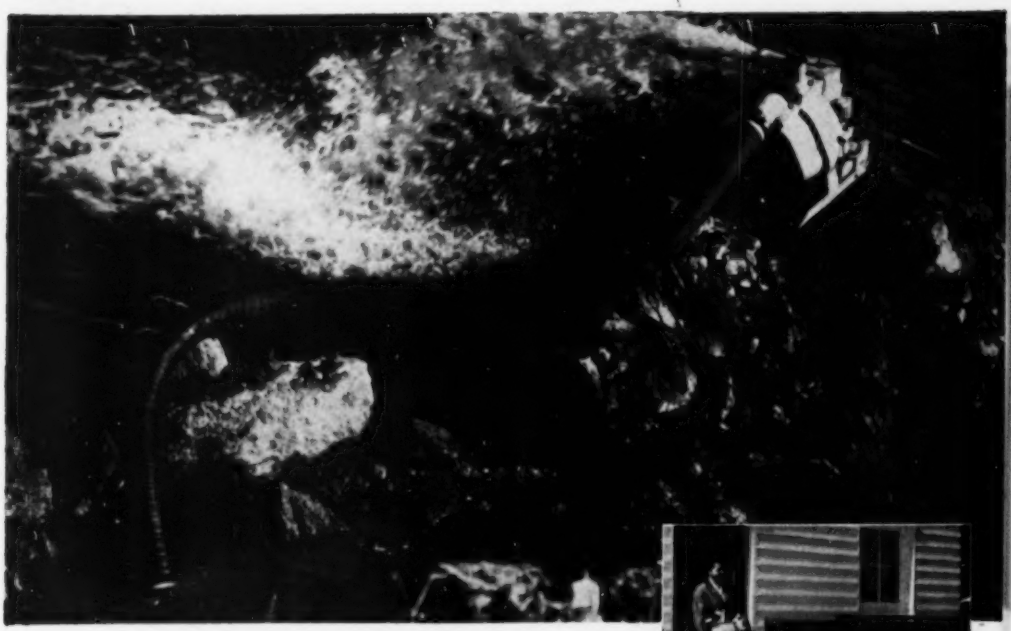
ACTION!

When You Need It — Where You Need It

HOMELITE *CARRYABLE* PUMPS



Homelite Field Service
When you need it — Where you need it
All over the country, Homelite Factory Branches are ready, willing and equipped to give prompt service in their shops or in the field as you need it.

The same thing happens every spring. Thaws and floods move into the scene...and when they do you want action, *fast pumping action.*

No pump will give you quicker action or better action than a Homelite Gasoline Engine Driven Pump. Small and compact, it presents no transportation troubles. One man can carry it and set it up quickly *any place you need it.* With the fastest automatic self-priming, a Homelite pumps up to 15,000 gallons. It keeps seepage at strainer level automatically. Has a guaranteed 28 foot suction lift . . . is non-clogging and completely weatherproof.

See it in action...on your job. Write for a free demonstration.

Manufacturers of Homelite
Carryable Pumps • Generators
Blowers • Chain Saws

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE
CORPORATION
706 RIVERDALE AVENUE • PORT CHESTER, N. Y.

New Waterbury Disposal Plant ... flash dries sewage sludge

A large forward step in lowering pollution in Connecticut's Naugatuck River was taken when the city of Waterbury opened its new disposal plant recently. Combining refuse incineration with sludge disposal and high temperature deodorization, the Waterbury plant effectively disposes of wastes for an equivalent population of 100,000.

The C-E Raymond Flash Drying Unit in this new plant is designed to dry over 29 tons of filter cake per day. This is equivalent to an evaporation rate of 2600 pounds per hour. The plant is designed so that the sludge can be dried and marketed as fertilizer, or incinerated to a sterile ash.

The Waterbury plant is typical of C-E Raymond System installations, now in service in virtually all parts of the country, meeting the varying requirements of both large and small communities. They are flexible in layout, highly efficient and thoroughly reliable; they provide for maximum utilization of waste heat.

The services of C-E specialists are available to assist you in finding the best solution to *your* sludge disposal problem. Get in touch with the C-E office nearest you for prompt attention. B-561

C-E Raymond Flash Dryer Systems installed, under construction or on order since 1945

BALTIMORE, Md.	SAN DIEGO, Calif.
BETHLEHEM, Penna.	SAN FRANCISCO, Calif.
BLOOMSBURG, Penna.	SCHENECTADY, N. Y.
CAMDEN, N. J.	SHEBOYGAN, Wis.
CHICAGO, Ill. (W. Southwest)	WASHINGTON, D. C.
FOND DU LAC, Wis.	WYOMISSING VALLEY, Penna.
HOUSTON, Texas	COLNE VALLEY, England
LANSING, Michigan	RECIFE, Brazil
LOS ANGELES, Calif.	

WATERBURY, Conn.

COMBUSTION ENGINEERING—SUPERHEATER, INC.

1315 North Branch Street **FLASH DRYER DIVISION** Chicago 22, Illinois

Western Office: 560 W. Sixth, Los Angeles 14, Calif. Eastern Office: 200 Madison Ave., N. Y. 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

Visitors to the Canadian International Trade Fair at Toronto June 2nd to 14th are invited to see the Layne display of Vertical Turbine Pumps.

"Making Hole"

is just part of our job!

The outstanding features of Layne constructed wells and pumps are pictured and described in a catalog entitled "Layne Well Water Systems." A copy will be sent on request.

To the well driller "Making Hole" means that everything is running smoothly and the hole is getting deeper and deeper. But to Layne, "Making Hole" is just part of building a fine well water supply.

Before a single rig is placed, Layne has used a lot of know-how planning, plotting and figuring out such things as; what size casing and what depth it is to be set, what kind and how much sand screen to use, what kind and size shafting to use and how much horse power the motors should have to produce the stipulated amount of water against a certain indicated pressure. Once all of these answers are on paper, they must be transmitted into an underground construction project—a task that requires more than ordinary skill and ability.

But whether for a single unit or many, you may be sure that if installed by Layne, all will have the same peak efficiency, operate with precision smoothness and be of utmost dependability for now and the years to come.

For late catalogs or specific information on any phase of Layne's water development services, address

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

Layne
WATER WELLS
VERTICAL TURBINE PUMPS
WATER TREATMENT

Every city has its own water conditioning problem.
Every water conditioning problem has its own solution.

PROBLEM No 1:

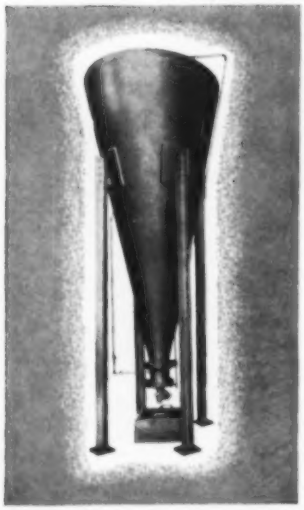
SLUDGE DISPOSAL.

Sludge from conventional softening processes contains 85% to 97% water by weight . . . requiring large land areas for lagooning or otherwise drying. Time and money are wasted. This nuisance is characteristic of *all* lime-soda water softening processes *except* . . .

SOLUTION:

PERMUTIT'S SPIRACTOR METHOD:

A cold lime-soda water softener with a revolutionary softening principle—*catalytic precipitation!* Spiractor's waste catalyst granules contain less than 10% water by weight after drainage—are easily disposed of, saving space . . . handling . . . costs.



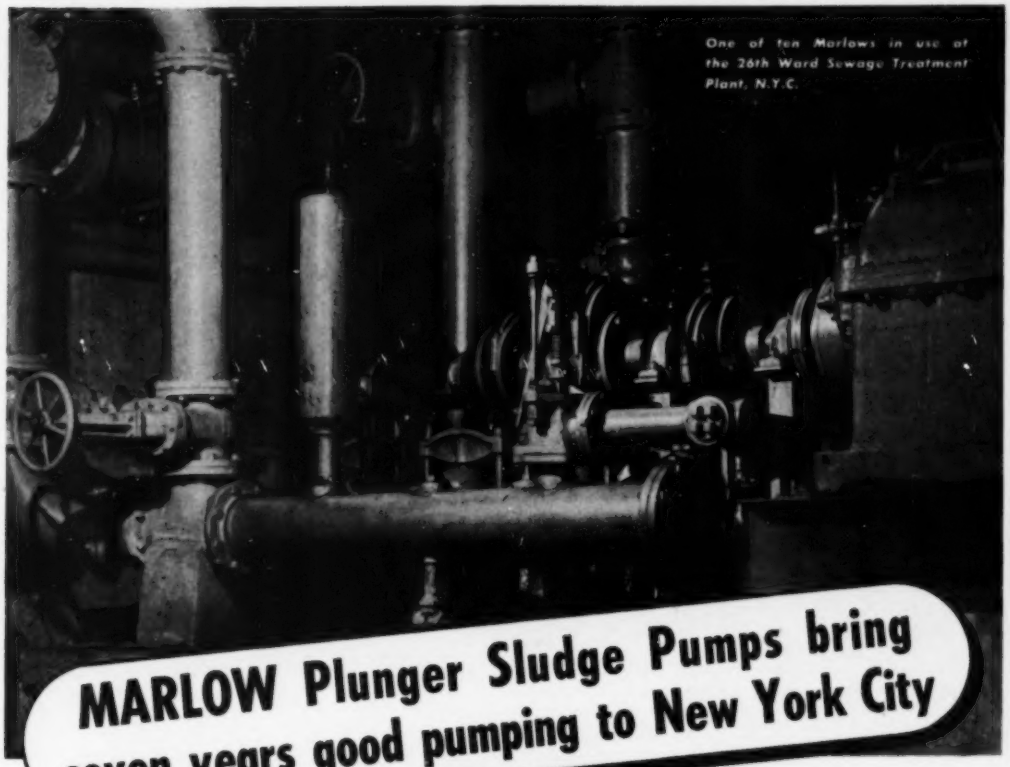
THE PERMUTIT® SPIRACTOR®

Operates speedily—softening takes *less than 8 minutes.* Hard water, lime, soda enter at base and swirl upward through catalyst. Calcium and magnesium are deposited on catalyst grains . . . gravitate toward the bottom. Water at top is soft, clear, low in alkalinity—ready for filtration.

For details write to The Permutit Company, Dept. W-5, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

PERMUTIT

WATER CONDITIONING HEADQUARTERS FOR 40 YEARS



One of ten Marlows in use at the 26th Ward Sewage Treatment Plant, N.Y.C.

MARLOW Plunger Sludge Pumps bring seven years good pumping to New York City

. . . and MORE

Most of the ten Marlows installed in this big plant have been on the job since 1943. Four are used for primary sludge, one pumps grease from the primary system to digester, three handle excess secondary sludge and two pump digested sludge from digesters.

Other Marlow New York installations include the Bowery Bay, Jamaica and Coney Island Sewage Treatment Plants. Marlows are installed in over 400 municipalities across the nation. And still the list grows. At present, big Marlow installations are being made by the city of Baltimore, at Nut Island Sewage Disposal Plant in Boston and at the North Point Sewage Disposal Plant in San Francisco.

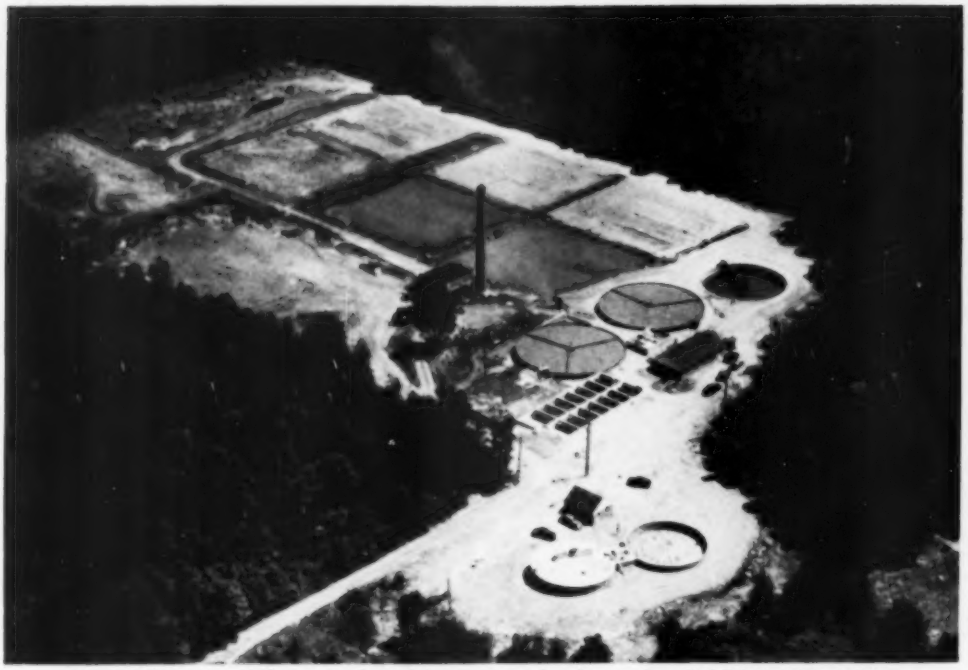
Marlows are preferred because they are more efficient, reliable and durable. Marlow Plunger Sludge Pumps are the result of years of advanced pump engineering. They are available with single, double, triple and quadruple plungers. 360 to 30,000 GPH standard displacement.

Write for details. Inquire also about the famous Marlow Self-Priming Centrifugal pumps — portable and stationary models — and Marlow Portable Diaphragm pumps.

MARLOW PUMPS

243 GREENWOOD AVENUE
RIDGEWOOD, NEW JERSEY

Manufacturers of the World's Finest Sludge Pumps



At Monticello, N. Y., peak flow reaches 6.0 mgd, in contrast to 0.6 mgd winter flow. Link-Belt Straightline Sludge Collectors equip two 20 x 95 x 8.8 ft. primary tanks, and L-B Circuline Collector—the 70 ft. dia., 7 ft. deep final tank.

Pick LINK-BELT sludge collectors for summer resort town

Monticello (N.Y.) sewage plant gets economical, flexible treatment for flows that vary as much as 10-to-1

The sewage treatment plant at Monticello, N. Y., presented a tough design problem . . . due to summer population increase from winter's 4300 to around 22,500. This also necessitated a high degree of treatment to protect vacationers from stream pollution and nuisance.

To solve this problem, consulting engineers W. A. Hardenbergh and Olney Borden chose Link-Belt Sludge Collectors—Straightline design on the two primary settling tanks and Circuline on the final settling tank. For both offer famous Straight-line action that accomplishes maximum sludge collection and complete sludge removal in the shortest time. Yet these collectors provide economical operation at all flow conditions.

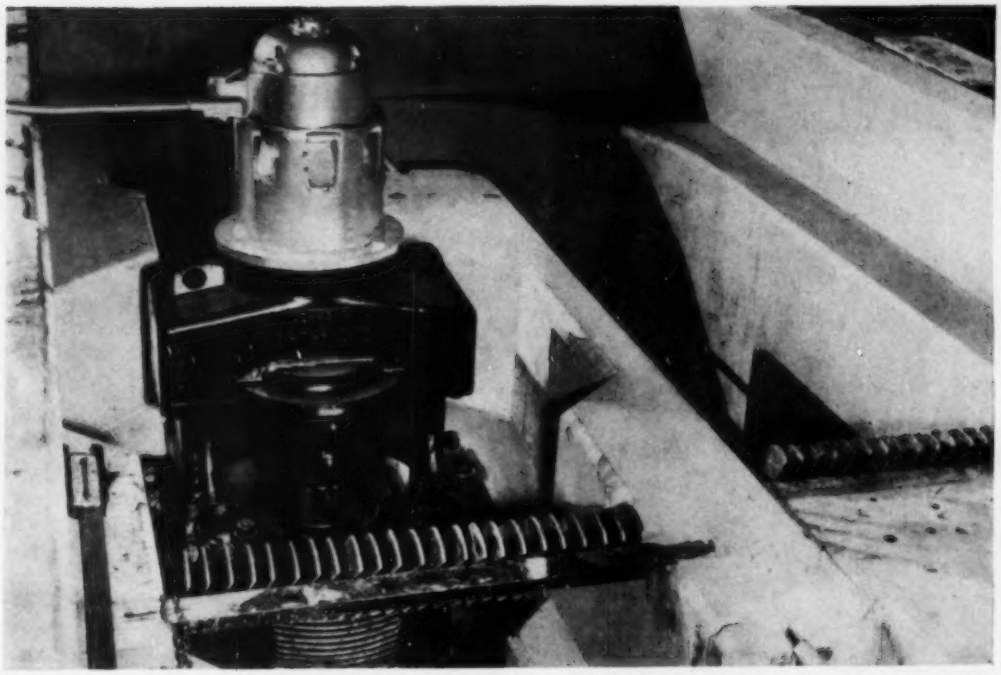
In addition to the sludge collectors, a Link-Belt Tritor Screen is used to remove the screenings and grit. A Link-Belt Sludge Elevator, liquid lime elevator and a belt conveyor aid in the sludge conditioning and sludge drying.

Our sanitary engineers will be glad to work with your engineers, chemists and consultants—help you get the best in modern water, sewage or industrial liquids treatment equipment.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12,004

LINK-BELT

SANITARY ENGINEERING EQUIPMENT



WORTHINGTON COMMINUTOR IS EASILY INSTALLED TO HANDLE LARGE VARIATIONS IN FLOW like this one at the Madison-Chatham (N. J.) Sewage Treatment Plant. Maximum wet-weather flows are occasionally as high as five times the average design dry-weather flow. An overflow screen is installed on top of the comminutor to screen flows in excess of the comminutor's capacity. Screenings are later raked down into the comminutor during period of normal flow. The overflow screen makes the comminutor independent of the by-pass on right which may later be used as a channel for a second comminutor. Plant Superintendent is Edward P. Molitor.

Madison-Chatham, N. J., installation proves adaptability of Worthington COMMINUTOR

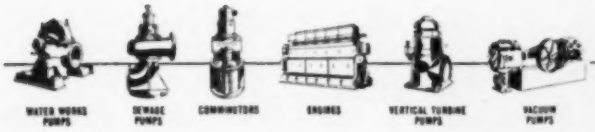
Typical example of the adaptability of the Worthington comminutor is the story of this installation at the Madison-Chatham Joint Meeting Sewage Treatment Plant in Chatham, N. J.

Engineers everywhere especially like the Worthington comminutor because:

- It can be readily installed in new or existing straight-flow rectangular channels.
- Cutter-racks are quickly removable for sharpening or replacement.
- It may be flooded without damage because it's protected by a mercury seal.

Worthington's public works specialists are ready to work with your community's engineer in solving screening problems—as well as other problems in sewage, water works, or municipal power generation. Write for Comminutor Bulletin W-2010-B3. Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Public Works Division, Harrison, N. J.

W.2.5

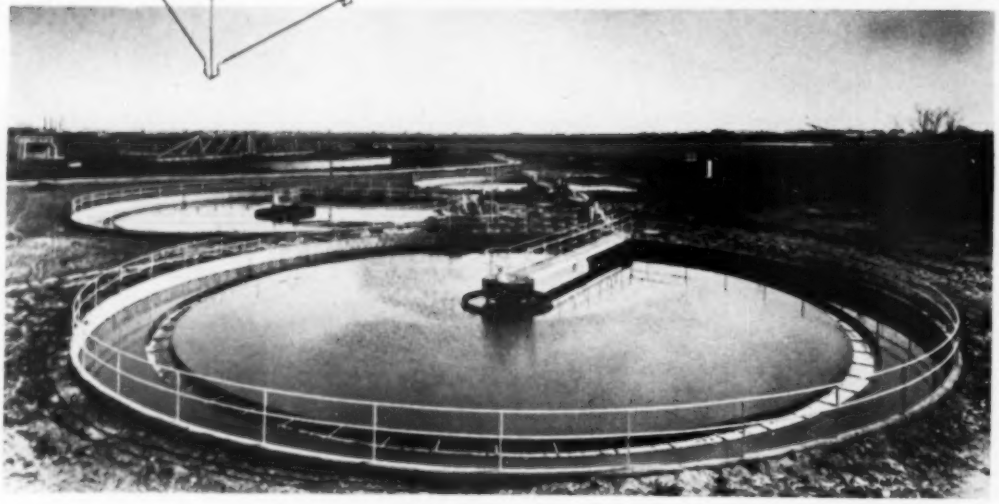


All Major Public Works Equipment Under One Responsibility

WORTHINGTON

Public Works Equipment

WHY THEY ORDERED *another* PROCESS CLARIFIER!



EARLY IN 1950 the city of Stockton, California, in order to double the secondary sedimentation capacity of their South Stockton Sewage Treatment Plant, added a 100 ft. dia. sedimentation tank equipped with a Process Type C Clarifier mechanism. One year later, in 1951, a third 100 ft. dia. sedimentation tank was erected and again equipped with a Process Type C Clarifier mechanism. The Type C has a center column that supports the drive unit and one end of the stationary walkway.

The picture above shows in the immediate foreground and the far background the two Process Clarifiers. In the background may also be seen one of the 166 ft. dia. biological filters equipped with a Pacific Flush Tank Company Rotary Distributor. Each of these rotary distributors has a total capacity of from 2300 to 7000 gpm.

Consulting engineer for the installation of the new Process Clarifier was the Engineering Office of Clyde C. Kennedy. Contractor: Fred J. Early Jr. Co., Inc. Plant operation is under the direction of F. Wayland Jones.

The choice of a second Process Clarifier is conclusive proof that they are rugged, built to last, trouble-free and economical. May we suggest that for new, improved equipment that has been developed, demonstrated and proven – investigate the products of Process Engineers Incorporated.

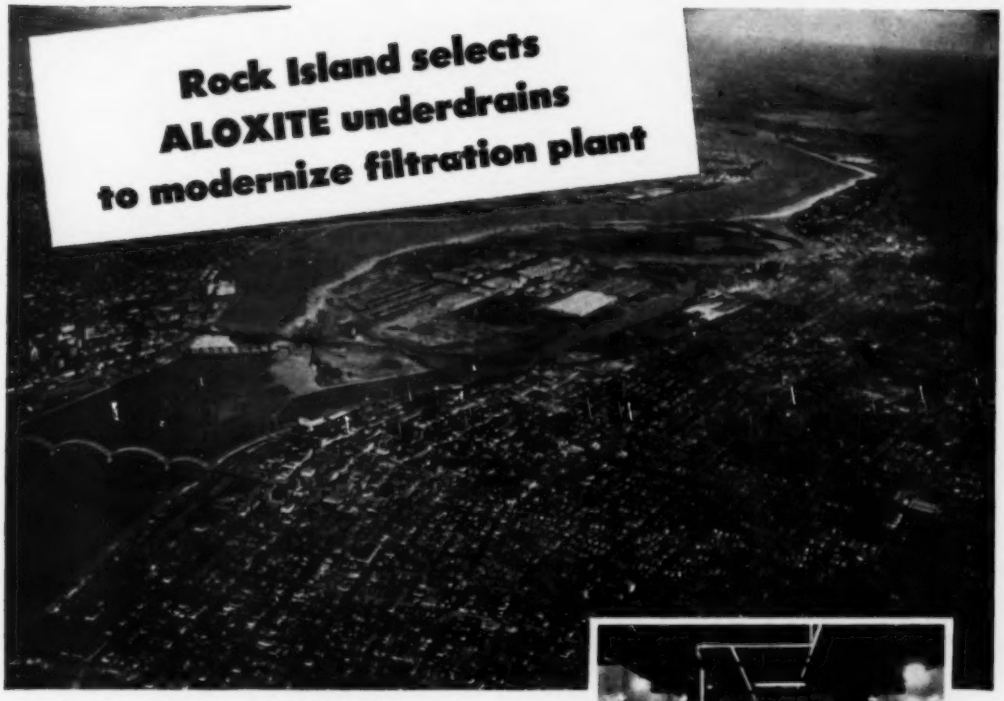
PROCESS ENGINEERS INCORPORATED

212 SUTTER STREET
SAN FRANCISCO 8, CALIF.

6381 HOLLYWOOD BLVD.
LOS ANGELES 28, CALIF.

EASTERN AND MIDDLE WESTERN REPRESENTATIVE:
PACIFIC FLUSH-TANK COMPANY · 4241 RAVENSWOOD AVE., CHICAGO 13, ILL.

Rock Island selects ALOXITE underdrains to modernize filtration plant



Information courtesy Rock Island Dept. of Public Works

Rock Island, Illinois, has reason to be proud of its waterworks. It's one of the best — as it must be, to keep abreast of the city's rapid growth.

The waterworks has 10 rapid sand filters, each of 1 MGD capacity. It has two 12 MGD and one 7 MGD pumps to supply the filters, and provide ample pumping capacity in reserve.

In connection with its recent modernization and expansion program, Rock Island joins the growing list of cities using the highly efficient porous underdrain system. ALOXITE aluminum oxide porous plates are installed in all 10 of their filters.

Rock Island is to be congratulated on its up-to-date waterworks. Our contribution — the porous plate underdrains — will go a long way toward insuring low operating and maintenance costs.

* * *

The recent modernization program of the Rock Island Waterworks was under the direction of Mr. James R. Palmer, Director of Public Works. Consulting Engineers — Greeley and Hansen, Chicago, Ill.

Operating floor of filtration plant

May we send you our popular booklet on porous media? Its 56 pages cover all fields of filtration and diffusion. No obligation, of course. Simply write to the address below.

Use porous plates and diffusers by

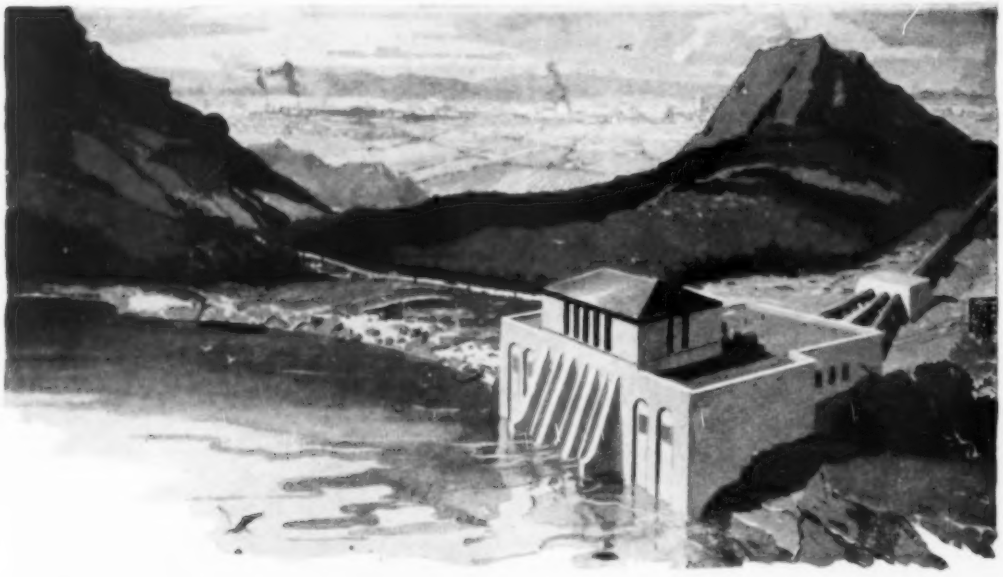
CARBORUNDUM

Trade Mark

Dept. M-62, Refractories Division

The Carborundum Company, Perth Amboy, N. J.

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company



WHEN Millions Live As One

ADVENTURESOME folk, since the beginning of time, have migrated . . . Settling in tiny clusters . . . Spreading spider-web fashion to dot the land with villages and towns . . . While others pressed forward, facing dangers concealed behind each rock and tree!

But with the growth of cities, new perils arose and multiplied . . . People were living too closely together . . . Epidemics and pestilence exacted their toll . . .

Then science and modern machinery rescued them from exposure to disease emanating from impure water and unsanitary waste disposal . . . And, today, *millions live as one!*

Rotovalves and Axial Flow Pumps, by Smith, are in service—controlling water, controlling floods and regulating sewage discharge, in important systems, far and wide.

The recognition and acceptance given these products are not accidental. They come from superior design, resulting from our more than 75 years of hydraulic experience . . . Facts that are significant, because they are proof positive of our ability to serve you, *if you place your problem in our hands!*

S·MORGAN SMITH COMPANY
YORK·PENNSYLVANIA~U·S·A·
If It's Hydraulics-Put It Up to Us·

POWER by SMITH

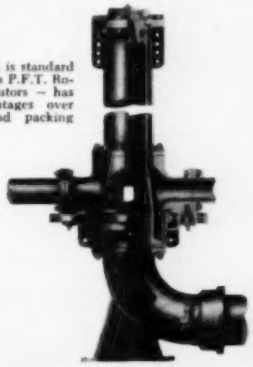
Doing a Good Turn for the Community

At sewage treatment plants where lack of head and maximum utilization of space are governing factors, the P.F.T. Rotary Distributor meets the need. In literally thousands of installations they are doing a good turn for the community by providing uniform distribution of sewage over the entire filter bed area, assuring fullest utilization of the filtering media.

Here again sound P.F.T. Engineering is evident in the design and construction materials used. Built for all-weather, maintenance-free operation, P.F.T. Rotary Distributors have established a splendid performance record.

Highlight of design is the patented P.F.T. Spreader Jet which fans out sewage depositing it in a thin layer on the filter bed, so that percolation is quickly effected. Data and list of installations available.

P.F.T. Rotary Distributors are available to meet the needs of any community. One of twenty 165' dia. units at Dayton, Ohio shown above — Two 100' units at Collinsville, Ill. Other units from 28' dia.



Mercury seal is standard equipment on P.F.T. Rotary Distributors — has many advantages over air lock and packing gland seals.

P.F.T.

PACIFIC FLUSH TANK CO.

Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

THE PICKEREL:

One of the Navy's famed "Guppy" class emerges at a 68-degree angle from 150 ft. depth. That's performance! The kind of performance that has always characterized the ships and men of the "silent service" in peace and war.

Two years ago, the snorkel equipped Pickerel made a 5200 mile run in 21 days without re-surfacing.

Ships, Men and Engines!

(OFFICIAL U. S. NAVY PHOTO)

The Pickerel is equipped with FAIRBANKS-MORSE *Diesel Engines*

FAIRBANKS-MORSE,

a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

FAIRBANKS, MORSE & CO., 600 South Michigan Avenue, Chicago 5, Illinois

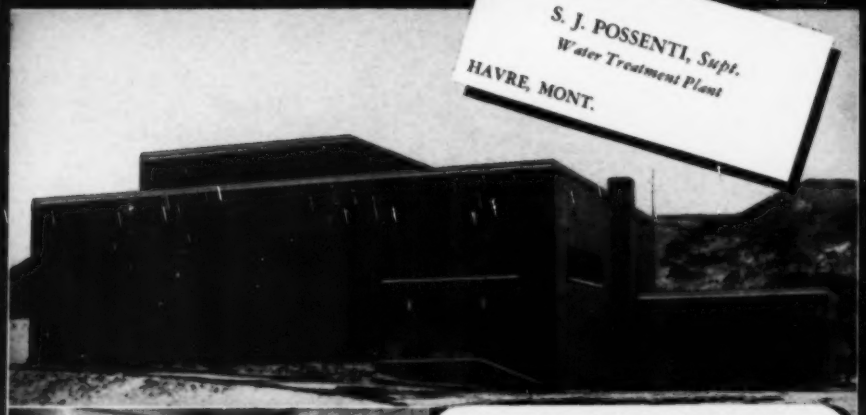
HAVRE, MONT.

Water Treatment Plant

(COMPLETED IN 1951)

BLACK & VEATCH
Consulting Engineers
KANSAS CITY, MO.

S. J. POSSENTI, Supt.
Water Treatment Plant
HAVRE, MONT.



B-I-F Industries Equipment furnished for the Havre Water Treatment Plant:

BUILDERS —

Raw-Water:
- **12" Venturi Tube and Flo-Watch Totalizer-Indicator-Recorder**

Filters:
- **10" Venturi Rate Controllers**
- **Loss of Head — Rate of Flow Indicators**
- **Filter Operating Tables**
- **Wheeler Filter Bottoms**

Filtered Water:
- **16" Venturi Tube and Flo-Watch Totalizer-Indicator-Recorder**
- **High Service Pressure Gauge**
- **Clearwell Depth Indicator**

OMEGA Chemical Feeders:

Rotolock Feeder with dissolving chamber for carbon • Universal Feeder with proportioning weir tank for alum • Belt Gravimetric Feeders with Lime Slakers • Dust Collectors

Careful planning is the "priceless ingredient" of any successful water works, and the Havre Water Treatment Plant is no exception. The need for additional water capacity was first recognized by the City of Havre more than five years ago. In 1947, after a thorough engineering study, it was decided to establish the Milk River as a second source of raw water to supplement the already over-taxed well supply. The new facilities include a thoroughly up-to-date softening and filtration plant of 2 MGD design capacity, capable of handling up to 3 MGD during peak demand periods.

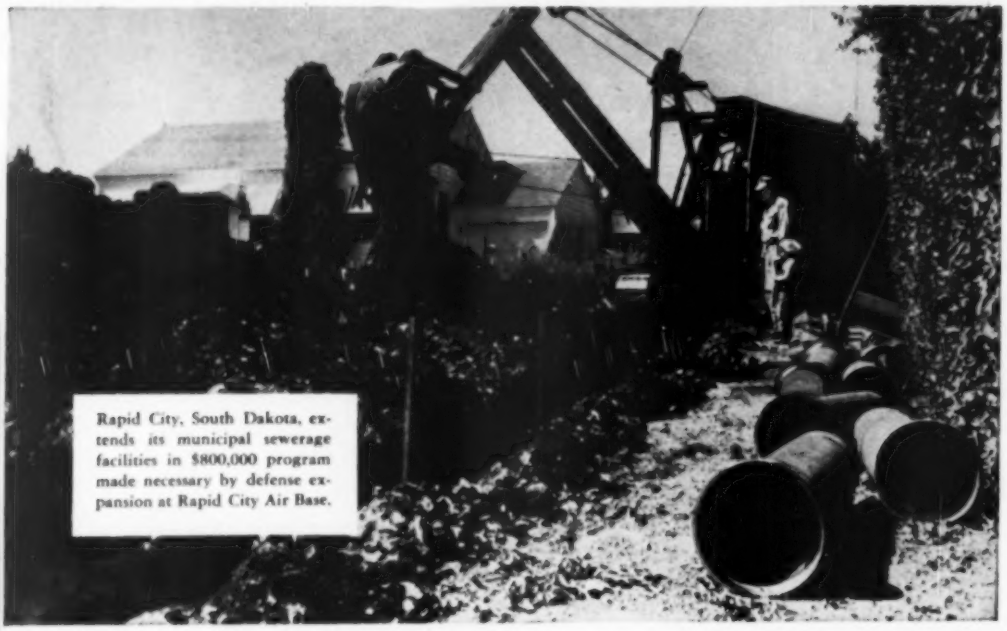
Filter operating equipment manufactured by Builders, was furnished and installed by C. E. Anderson, sub-contractor to Haggerty-Messmer Company of Bozeman, Mont. Builders Flow Meters, Controllers, and Gauges now form an integral part of the Havre Water Treatment Plant, assisting in its smooth, efficient operation. For complete information and Bulletins describing Builders Water Works Equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

B-I-F INDUSTRIES

BUILDERS-PROVIDENCE

BUILDERS

CLAY PIPE—*ESSENTIAL* ★ *ECONOMICAL* ★ *EVERLASTING*



Rapid City, South Dakota, extends its municipal sewerage facilities in $800,000 program made necessary by defense expansion at Rapid City Air Base.

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Above—rear view of the Fine Screens (upper left) in the 26th Ward Plant showing Jeffrey Belt Feeder and Screening Grinder.

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CONTRACTORS:
First Section: M. S. Hudgins, General Contractor, Roanoke, Va.
Second Section: Wiley N. Jackson, General Contractor, Roanoke, Va.

CONSULTING ENGINEERS: Alvord, Burdick & Howson, Chicago, Ill.

ASSOCIATE ENGINEERS: Mattern, & Mattern, Roanoke, Va.

IN GENERAL CHARGE: John L. Wentworth, Director of Public Works, Roanoke, Va.

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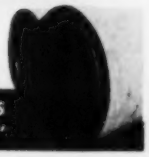

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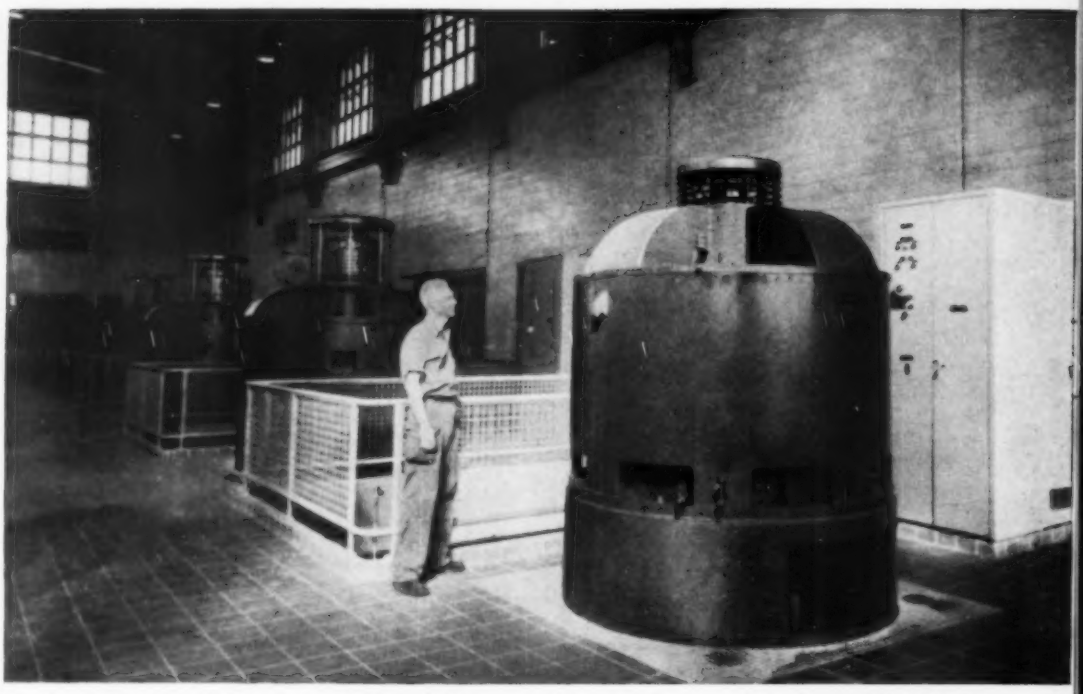

In main pump room, six G-E motors ranging from 450 to 700 hp drive centrifugal pumps. G-E control beside each motor provides speed and field control for wound-rotor and synchronous motors respectively. Plymouth Electric Construction Company served as electrical contractor for the new sewage treatment plant.

New York takes another step

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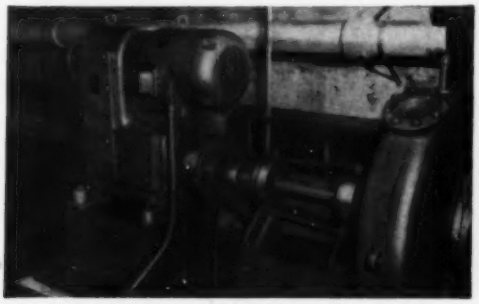

Tri-Clad* totally enclosed motor shown here is one of several driving pumps which move sludge from basins to digestion chambers. All such motors are centrally controlled.

*Reg. Trade-mark of General Electric Company

G-E switchgear provides primary control and protection for large motors and for transformers supplying 440-volt motors. Plant generates most of its power from sludge-digester gas.

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Capacity of Owls Head—160 mgd—is designed to serve the area's present population of one million plus an eventual increase of 20 percent. While it will immediately reduce pollution of lower New York Bay, the new plant's total effect will not be achieved until 1959 when all elements of the city-wide system will be in operation. Then, all waste entering sewers in metropolitan New York will be placed under treatment.

G-E equipment, backed by G-E application engineering assistance, proved valuable to New York in creating Owls Head. In the same way, General Electric, working with your consultants, can help with your sewage-plant electrical system. Call in your G-E representative *early in the planning.* And to gain public support for your new sewage facilities, ask him now how you can put G.E.'s CLEAN WATERS program to work in your community. *General Electric Co., Schenectady 5, N. Y.* 666-72

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WATER & SEWAGE WORKS

VOL. 99, NO. 6 • A GILLETTE PUBLICATION • JUNE 1952

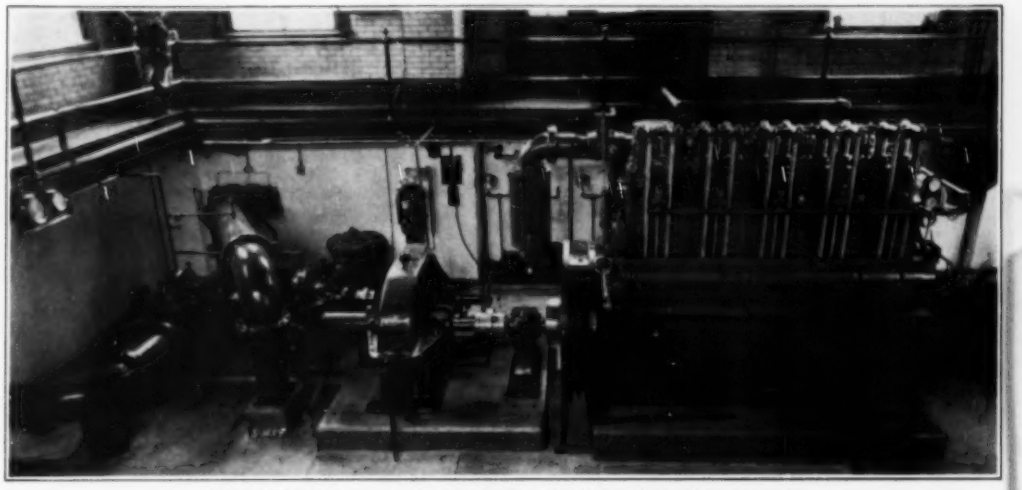


Fig. 4—Diesel low speed engine driving centrifugal through speed step-up gear.

Basic Factors
In Preparing a Centrifugal Pump Inquiry

Part II*—Suction and Discharge Conditions; Total Head; Load Factor; Characteristics of Driving Element; Axis of Rotation; Special Requirements, etc.

by ROY CARTER *and* IGOR J. KARASSIK, *Application Engineers*
Worthington Corporation, Harrison, N.J.

THE first of this three part article presented a discussion of the effect of the number of pumps required, of the nature of the liquid to be pumped, and of the required capacity on the selection of the proper centrifugal pump for any given installation.* We will continue with the analysis of the fourth and remaining factors which need be considered or determined before an inquiry for the required equipment is prepared.

4—Suction Conditions

It is *extremely* important to determine very accurately the suction conditions which will prevail in the proposed centrifugal pump installation. If the available net positive suction head (NPSH) is less than the minimum required by the pump selected at the desired capacity, the pump will be unable to meet its capacity design conditions. In addition, destructive cavitation may result from the unsatisfactory suction conditions and cause serious damage to the pump impeller, shortening the life of the equipment to an appreciable degree. A typical group of performance curves for a given pump operating under varying suction conditions is presented on Fig. 5.

If cold liquids are handled, it is necessary to know whether there will be head on the suction or whether the pump will operate on a suction lift. If the latter, what will be the maximum lift? In the event that the liquid is hot or under a pressure corresponding to or near its vapor pressure, the pump *must* be installed with head on suction and the available submergence must be made known. In all cases, it is advisable to determine separately the static difference between the liquid level and the pump centerline and the friction and entrance losses in the suction piping. If these losses have not been determined, it will generally suffice to describe accurately the suction layout, indicating all lengths and sizes of pipes, as well as fittings, valves, etc. (For effect of elevation above sea level, see item 11, "Location of Installation").

5—Discharge Conditions

The discharge head for the design conditions should be stated with the understanding that it is generally composed of static elevation (or pressure) and frictional losses in the discharge piping and that any variations in the static head must be known in order to determine the maximum and

* Part I of this three part series on "Preparing a Centrifugal Pump Inquiry" appeared in our March 1952 issue.

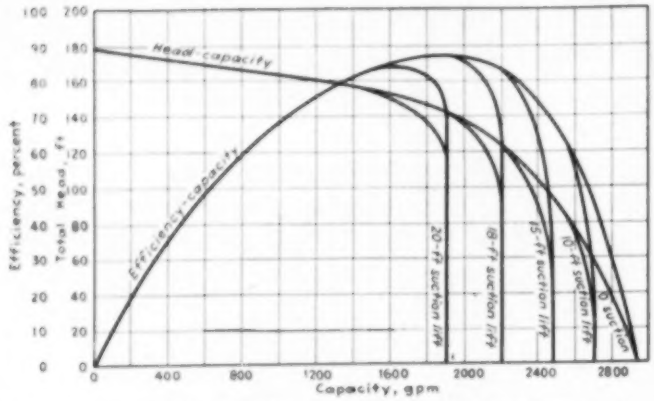


Fig. 5—Curves revealing that when suction lift against which centrifugal pumps operate is in excess of given values, both pump capacity and efficiency drop below normal.

the minimum head against which the pump is to operate. Specifying an excessive total head has actually the same effect as specifying excessive capacity. Since a centrifugal pump will always operate at the intersection of its head-capacity curve and of the system-head curve (*) a pump which develops an excess of head will, unless artificially throttled, deliver an excess in capacity as its curve will intersect the system-head curve at a greater flow.

* See "Basic Factors in Centrifugal Pump Application" (Part 5) by Messrs. Carter and Karassik, *Water and Sewage Works*, October, 1951.

By breaking up the discharge head into static and friction head, we are also able to tell whether the friction losses are excessive. If the piping to be used is too small, the required pump and its driver will be more expensive than necessary and the cost of operation greater than if the proper size pipe was used.

When the total cost involved is high and justifies an extremely detailed analysis, it is possible to determine the most overall economical size of pipe by comparing the sum of the amortization of initial pump, the driver and piping cost, plus the operating cost, versus cost of various pipe sizes.

In certain special applications, for short periods the pump may be required to develop discharge pressures in excess of the design conditions. A typical example is a condenser water circulating pump which is to be installed in a system utilizing a syphon effect. The head to be developed consists only of the frictional losses through the piping and through the condenser itself and is therefore of fairly low magnitude. However, in order to enable the condenser circulating pump to deliver water through the condenser, it is necessary to prime the system; in other words, to discharge water over the syphon. In this and similar cases the design of the pump must be such as to permit it to develop a head at shut-off considerably higher than the normal operating head.

In some condenser circulating pump installations the starting head required, before the syphon is established, might so affect the characteristic curve which must be developed that the normal operating head occurs at a point on the curve where the pump efficiency is relatively poor. However, in a syphon system it is generally possible to eliminate the higher starting head requirement by incorporating a vacuum producing device. This device, which is being increasingly employed, is connected to the top of the syphon, so that the air at the high point can be evacuated and the syphon established with the pump producing a head no greater than that required for normal operation. In many other cases, a little study and/or the installation of relatively inexpensive additional equipment will often simplify a problem of this nature.

6—Total Head

As defined in an earlier article by the writers ("Basic Factors in Centrifugal Pump Application," [Part 2], *Water and Sewage Works*, February, 1951), the total head of a centrifugal pump is the difference between the discharge head and the suction head and is therefore the net energy imparted to the liquid by the pump. It should be remembered in determining the required total head that if variations are expected in both the suction and discharge conditions, similar variations will occur in the required total head. Furthermore, if the individual variations are, as usual, independent of each other, the possibility always exists that extremes in suction and discharge conditions may occur simultaneously. It is highly important, therefore, to determine *quite accurately* what the possible variations in required total head will be and to specify whatever information can be made available as to the interrelation of variations of the two elements which determine the total head.

7—Load Factor

The expected load factor of the contemplated installation will play an important part in the selection of the best pump to be used. We have already seen in the first installment of this series (March, 1952), to what extent the load factor will determine the number of units required to most effectively provide the capacity requirements. In addition, if the service is intermittent, it is unnecessary to use the most efficient pump available, the selection being generally made on the basis of least first cost. On the other hand, a pump intended for continuous

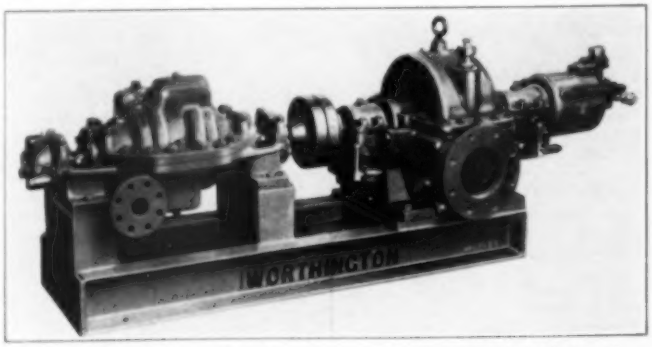


Fig. 6—Steam turbine drive, often more economical in industrial installations, is common practice in boiler feed water pump installations.

service should be selected primarily on the basis of efficiency, reliability and long life.

8—Axis of Rotation

While the majority of centrifugal pumps are horizontal units, conditions are frequently encountered wherein a centrifugal pump with a vertical axis of rotation will prove to be more suitable. This is especially true in sewage pumping. Axial-flow propeller pumps and certain mixed-flow type pumps are frequently arranged for vertical operation. This results in a space saving installation and permits location of the pump insuring that the impeller is at all times under positive head, so that the pump is always primed. At the same time, the motor driver can be placed above the pump at a level sufficiently high to avoid accidental damage to the driver should the water level rise excessively. Sewage pumps of large size are prevalently installed in this manner and in a large measure the smaller size sewage pumps are also of vertical shaft design.

Vertical pumps can be arranged either for wet or dry pit installation. (See Figs. 7 and 8.) Since the *types* of pumps used for these two categories are quite different, it is very important to determine which of the two applications is preferable for any particular installation.

9—Characteristics of Driving Power

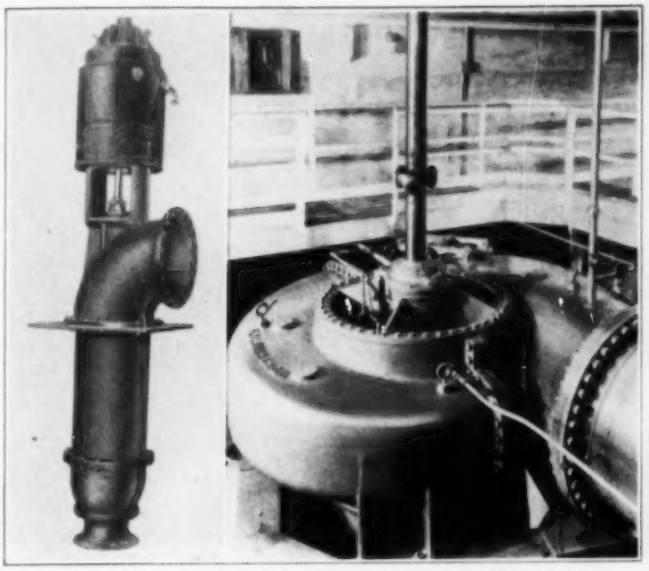
While modern centrifugal pumps are usually driven by electric motors, steam turbines or internal combustion engines, there are a great number of other types of drives as well as means of power transmission.

A centrifugal pump may be driven by:

1. Electric motor
2. Steam turbine
3. Gasoline engine
4. Diesel engine
5. Water turbine
6. Gas turbine

The driver may be connected to the pump by means of:

1. Direct drive through a coupling
2. Flat belt or multi-V-belt drive
3. Gear drive
4. Hydraulic coupling
5. Magnetic clutch or coupling



Figs. 7 & 8—Vertical wet-well sewage pump on left operates submerged. Dry-pit vertical pump on right prevalently used in sewage treatment plants, particularly the larger plants.

Finally, a centrifugal pump may be operated either:

1. At constant speed
2. At adjustable speed

A centrifugal pump, its drive and its method of operation should form an integral and harmonious unit. The specific application, and service for which the pump is intended, will dictate not only the choice of the pump itself but of its driver as well.

The electric motor is by far the most common type of driver for centrifugal pumps because electric power is usually the most economical and convenient source of energy. When steam is available at a lower cost than electric power, a steam turbine might be preferred. In many cases, standby pumps are turbine or Diesel driven as a protection against electric power failure. In some instances, the exhaust steam from the turbine is used for process work or for heating and thus the turbine acts as a reducing valve to produce low pressure steam.

Gasoline or Diesel engines are used to drive centrifugal pumps mainly where there is no adequate electric power supply or where protection is required against failure of the electric power supply. Many dual driven centrifugal pumps are fitted with an electric motor at one end and a gasoline or Diesel engine at the other to take care of economy and also provide absolute reliability.

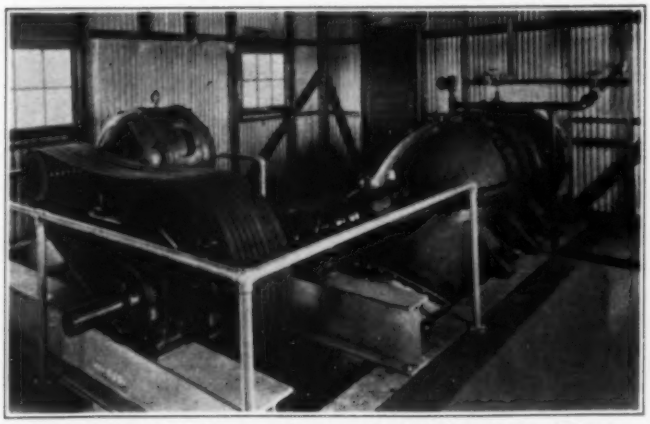


Fig. 9—Propeller type 42" pump with motor and multi-V-drive. Used in drainage, irrigation, and storm-water pumping. New Orleans has many of this type.

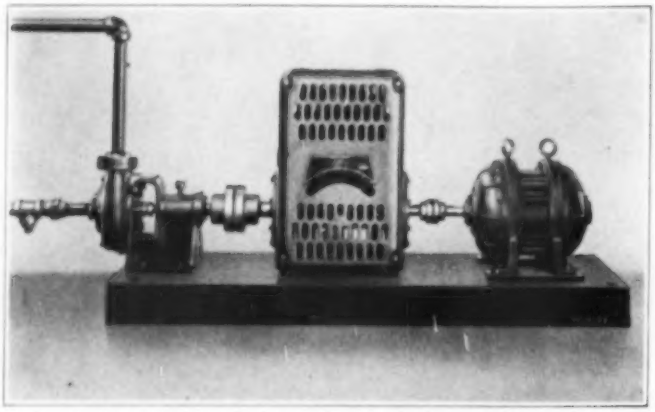


Fig. 10—Vari-speed drive unit between constant speed motor and pump. Wide variation in pump output obtainable by varying speed ratio through this unit.

Diesel engines are more economical than gasoline engines in operation, but higher first cost is involved. Low head drainage and irrigation pumps handling large quantities of water require slow speed centrifugal pumps, and large HP, making the Diesel engine an excellent driver. Dual-fuel Diesels, utilizing sludge digestion gas and/or fuel oil, are prevalently employed in modern sewage treatment plants.

Water turbine drives have a limited application where a large supply of water is available as a cheap source of energy. As to gas-turbines, their use is still extremely limited, but indications are that applications will grow rapidly as the art of gas turbine design progresses.

Direct connection between a pump and its driver is generally preferred. However, centrifugal pumps are frequently belt driven when it is necessary or desired to use a driver—such as an engine or electric motor—having a rated speed other than that required by the centrifugal pump. Such an arrangement is also used when space requirements make it impossible to connect the pump and its driver in tandem and when they must be mounted alongside of one another.

Gears are used to step the driver speed up or down for the same reasons that belt drives are used. Thus for instance, gears are frequently used with turbine drive in order to retain the high speeds conducive to low turbine water rates regardless of the low speed that may be required at the pump. On the other hand, it is quite common to use a separate gear between a Diesel engine and a centrifugal pump in order to step up the relatively low speeds of these engines.

Hydraulic and magnetic couplings are mainly used in order to obtain variable speed at the centrifugal pump while operating the driver at constant speed.

10—Space and Weight Limitations

It is sometimes necessary to install a pump in very cramped quarters and vertical pumps are usually preferred in such cases, as they take up only a small fraction of the floor space required by a horizontal pump of equal capacity. As an alternate, it is possible to select a pump operating at the highest speed compatible with the conditions of service, since this also serves to reduce space requirements. Although the use of close-coupled pumps (Fig. 11) was introduced primarily from consideration of first-cost economy, the application of such pumps presents very definite space-saving advantages. Finally, in a number of cases, the use of horizontal pumps with bottom suction (Fig. 13) may simplify considerably the problem of spacing and suction piping accommodation.

In general, the weight of the pump is a matter of no special importance, but aboard ships, for instance, weight is a deciding factor. For this reason, it is the practice in navy and merchant marine installations to use extremely high speed units of special design, operating at speeds up to 7500 rpm, and generally turbine driven. The pump design itself is directed towards the elimination of excessive weight through the use of lighter but stronger materials and the cutting away of all metal which can be dispensed with.

The facilities available for transportation should be outlined if there is anything unusual about them. Sometimes it is a long journey from the factory where a pump is built to the place where it is needed and it may be that over a part of this journey the transportation facilities are poor. Cases arise where horses and mules must be depended upon and where all freight must be carried on pack saddles. For transportation over such routes, pumps must be supplied which are light in weight and which are of sectionalized construction so that no single part is too heavy for horse or mule back.

In other cases a pump must be brought to its ultimate destination through tunnels or shafts of limited dimensions and the pump selection must be made with such restrictions in mind. All such limitations must be carefully listed lest a pump fully built may prove to be deliverable short of its installation point.

11—Location of Installation

The geographical as well as immediate location of the installation has a great bearing on proper pump selection and on its maintenance.

The elevation above sea level affects the pump in that there is a decrease in atmospheric pressure of about 1 in. of mercury per 1000 feet of elevation.* At an elevation of 4000 feet, therefore, the atmospheric pressure is 4 in. mercury or about 4.5 feet less at sea level. This means that a centrifugal pump can handle 4.5 feet less suction lift than at sea level.

* See "Basic Factors in Centrifugal Pump Application" by Messrs. Carter and Karassik, (Part I, Fig. 3), *Water and Sewage Works*, Jan. 1951.

The geographical location must also be taken into consideration when spare parts are to be recommended, since a pump which is to operate in an out-of-the-way place should be supplied with sufficient of the more important spare parts to avoid interruption of service if parts become worn and cannot be readily replaced. As a matter

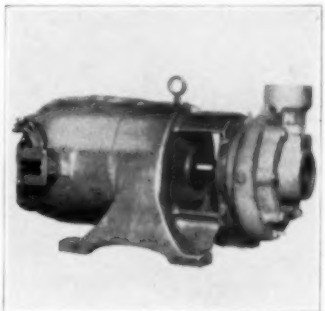


Fig. 11—Inexpensive design of package-style utility pump unit. Close coupled pump-motor combination on common base.

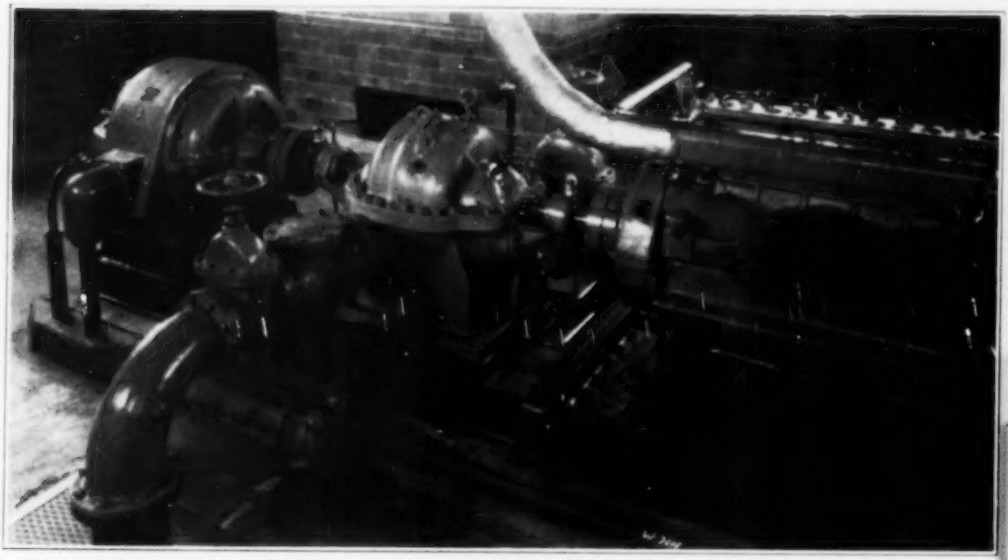


Fig. 12—Dual power drive centrifugal pump installation insures dependable service in case of power failure. Also serves to keep down electric power costs.

of fact this same recommendation applies in general, regardless of location of the installation. An adequate supply of spare parts is less expensive than extra stand-by pumping units.

The immediate surroundings of a pump will affect the accessibility after installation. It hardly needs saying that a pump located in a cramped or dirty and wet or poorly lighted position will surely be negelected by the operators, will not give satisfactory service and will be difficult to inspect, dismantle and repair.

12—Special Requirements

This factor must perforce cover a "multitude of sins." It is highly important that the pump manufacturer be made familiar with any special requirements and preferences of the personnel which is to be responsible for operation and maintenance of the pumping equipment. Some of these preferences may be based on insufficient knowledge of the most modern practices and equipment, but they may as likely originate from experience with pumps operating under the same or similar conditions that the new pumps will have to meet. Much valuable miscellaneous information may be made available to the pump manufacturer, information which will enable him to furnish that type of equipment which will give the longest and most reliable service.

The customer's recommendations, however, should be limited to the user's experience with pumps operating under similar conditions rather than form a list of his preferences, lest such preferences result in the purchase of *very special* and expensive equipment. Whenever the manufacturer's standard design and construction can be used, it is preferable to especially built units, both from the point of view of the original cost and from that of obtaining repair parts in later times.

In addition, it is necessary to take into serious consideration the expected ultimate life of the installation. If the design and materials of construction of centrifugal pumps are selected on a life expectancy much in excess of the life expectancy of the process or installation for which the equipment is intended, the original cost of the latter will be out of proportion. In other words, while it is a short-sighted policy to purchase equipment with a twelve month life for an installation designed to last fifteen years, it is just as wasteful to buy a pump to last twenty years if a temporary six month use only is contemplated.

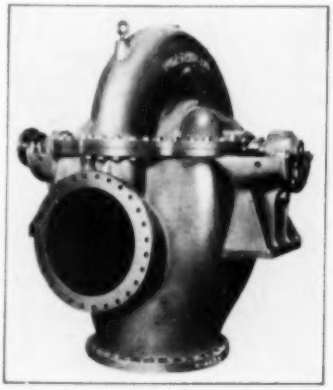


Fig. 13—Horizontal drive centrifugal with suction intake entering at bottom of pump is termed bottom-suction pump.

Certain applications involving pump installations in office buildings, hospitals, etc., have special requirements relative to quietness of operation. These requirements should be listed on the inquiry in terms of permissible sound levels expressed in decibels. It is not advisable, however, to specify a specific maximum speed of operation to achieve the required quietness inasmuch as the selection of low speed centrifugal pumps does not in any way assure quietness of operation. Since every service condition has a best rotative speed for hydraulic correctness of application, a speed lower than the correct hydraulic speed is more likely to be hydraulically noisy than not.

Ed. Note: The next and concluding installment of this series on "Preparing a Centrifugal Pump Inquiry" will be devoted to requirements to meet a variety of specific services, including services in various industrial applications as well as water, sewage, irrigation and industrial wastes.

1952 Annual Roundup of A.W.W.A.

Kansas City Conference Highlights

Head Officers

Chas. A. Capen, President — *M. B. Cunningham, Vice-Pres.*

A NEW flood came to Kansas City, one which the city enjoyed having—1986 members and guests registered for the May 4-9 Conference of the A.W.W.A. This attendance outdid in numbers any previous meeting of the Association except that in Philadelphia, the score to date being:

1967	Chicago	'49
2007	Philadelphia	'50
1906	Miami	'51
1986	Kansas City	'52

The Conference clearly enjoyed Kansas City and the hospitality of the local committees whose members did an outstanding job. The weather was warm and bright, the meeting and exhibit facilities of the municipal auditorium were excellent, the technical program and social events were considered equal to, if not better than those of any previous meeting. In general, the Kansas City Conference set a high standard for all future meetings.

Cited for special recognition for the excellence of the Conference, were N. T. (Tom) Veatch, Chairman of the Convention Management Committee, and Mrs. M. P. Hatcher, Chairman of the Ladies Local Committee.

The program included a total of sixteen individual technical sessions—division meetings, general sessions, and open meetings of committees.

Special Meetings

A.W.W.A. Sections held special luncheon meetings—the Missouri Section, the Kansas Section, the California Section, the Michigan Sections, and a joint New York-New Jersey Section meeting.

The Fuller Award Society held its annual breakfast meeting.

The Water and Sewage Works Manufacturers Association members met at a luncheon meeting.

Inspection Trips

Transportation was provided for inspection tours of the main water treatment plants of the two Kansas Citys. These are the water softening plant of Kansas City, Mo., having a capacity of 125 mgd.; and the Quindaro Water and Light Plant of Kansas City, Kan., where the filtration plant has a capacity of 30.5 mgd.

A special inspection was also arranged for visits to the Midwest Research Institute, to view a McIlroy Pipeline Network Analyzer in operation.

Manufacturers' Exhibits

The newest and finest in water works equipment was on display in 145 exhibits of 87 manufacturers. The exhibition hall was a busy and important feature of the Conference. Both members and manufacturers' representatives profited by the opportunity to discuss water works equipment and its application.

Social Events

There was no let-down at any time in the program of the "72nd Roundup" of the A.W.W.A. in Kansas City. From the beginning, on Sunday, social events started with "Meet and Greet Night," and followed through to the Annual Dinner and Dance of Thursday evening. In between, the evenings were assigned to Reception and Awards Night on Monday, the Cow Town Jamboree on Tuesday, and a very special screen showing (for A.W.W.A. conventioneers only) of "The River," beautiful new color motion picture of India.

Monday, from dawn to dark, was given over to those competing in the Annual Golf Tournament at the Milburn Country Club.

For the distaff side of the Conference, events included a Tour and Tea on Monday (Kansas City and Hillcrest Country Club), a Play Day on Tuesday (Orpheus in the Underworld presented by the Univ. of Kansas City players), and a Luncheon-Card Party on Wednesday, in addition to the evening affairs.

Office Heads

Harry E. Jordan, Secretary — *R. J. Faust, Asst. Exec. Secy.*

New Officers

Taking office at the close of the Conference, to serve through the next annual meeting (Grand Rapids, Mich., May 10-15, 1953), are these officers of the Association:

President—Charles H. Capen, Chief Engr., North Jersey Water Supply Comm., Wanaque, N.J.

Vice-Pres.—Morrison B. Cunningham, Supt. & Engr., Dept. of Water and Sewage, Oklahoma City, Okla.

Treasurer—Wm. W. Brush, Editor, "Water Works Engineering, New York, N.Y.

Division Officers

The Water Purification Division elected the following new officers:

Chairman—Ray L. Derby, Prin. San. Engr., Dept. of Water & Power, Los Angeles, Calif.

Vice-Chm'n.—W. W. Aultman, Asst. Director, Dept. of Water & Sewers, Minami, Fla.

Secretary—Wm. Yegen, Supt. of Filtration, Bismarck, N.D.

Convention Management

N. T. Veatch, Chmn., Kansas City — *E. S. Millar, Wichita, Kan.* — *M. P. Hatcher, Kansas City* — *E. L. Filby, Kansas City*

Trustees—H. C. Medbery, Engr. of Water Purification, San Francisco, Calif., and P. E. Pallo, San. Engr., Hackensack Water Co., New Milford, N.J.

The Water Works Management Division elected these new officers:

Chairman — M. B. Cunningham, Supt. & Engr., Water Dept., Oklahoma City, Okla.

Vice-Chairman—W. A. Glass, Director, Dept. of Water & Sewers, Miami, Fla.

Secretary—N. S. Bubbis, Gen. Mgr., Greater Winnipeg Water Dept., Winnipeg, Man.

Exec. Comm.—F. C. Amsbary, Jr., V.P. & Sec'y., Ill. water Service Co., Champaign, Ill. and D. L. Erickson, City Engr., Lincoln, Nebr.

The Water Resources Division will be headed by:

Chairman—Dale L. Maffit, Gen'l. Mgr., Water Works, Des Moines, Iowa

Vice-Chm'n.—F. W. Kittrell, Chief, Stream San. Sec. TVA, Knoxville, Tenn.

Secretary—Fred Merryfield, Prof. of San. Eng., Oregon State College, Corvallis, Ore.

Exec. Comm.—L. E. Goit, Ch. Engr., and Deputy Genl. Mgr., Dept. of Water & Power, Los Angeles, Calif. and C. H. Bechert, Director, Indiana Dept. of Conservation, Div. of Water Resources, Indianapolis, Ind.

The new fourth division of the Association, now titled the Transmission and Distribution Division, elected the following:

Chairman—E. A. Schmitt, Head Engr. and Chief, Water Supply Div., Washington Aqueduct, Washington, D.C.

Vice-Chm'n. — Max K. Socha, Engr., Water Distr. Div., Dept. of Water and Power, Los Angeles, Calif.

Secretary—F. E. Dolson, Distr. Engr., St. Louis County Water Co., University City, Mo.

Trustees — W. E. MacDonald, Comm. of Water Works, Corp. of City of Ottawa, Ottawa, Ont. and H. W. Niemeyer, Supt. of Distr., Indianapolis Water Co., Indianapolis, Ind.

Division Officers

Ray L. Derby, Chairman, Purification — *W. A. Glass, Vice-Chairman, Management* — *D. L. Maffit, Chairman, Resources* — *E. A. Schmitt, Chairman, Trans. & Dist.*

(Chairman of the Water Works Management Division is M. B. Cunningham, new Vice-President of the Association)

Honorary Membership

Three distinguished members were recognized for their contributions to the Association (text of the citation was given in *Water & Sewage Works*, February 1952, page 58), and were presented with Honorary Membership:

Honored
Abel Wolman, Achievement Award

Norman Joseph Howard, Director of Water Purification, Toronto, Ont.

Howard Scott Morse, Retired General Manager, Indianapolis Water Company, Indianapolis, Ind.

Nathan Thomas Veatch, Senior Partner, Black and Veatch, Kansas City, Mo.

The Harry E. Jordan Achievement Award

The new "Harry E. Jordan Achievement Award" of the A.W.W.A. is intended for presentation to denote particularly outstanding and distinguished service of a member *outside the line of duty* and to recognize the achievements of Secretary Jordan. First recipient of this award (for citation see *Water & Sewage Works*, February 1952, pages 58-59) is:

Abel Wolman, Professor of Sanitary Engineering, Johns Hopkins University, Balytimore, Md.

More Awards and Prizes

The John M. Diven Memorial Medal of the Association was awarded to:

Ernest Willard Whitlock, Partner, Malcolm Pirnie, Engineers, New York, N.Y.

The Association's John M. Goodell Prize went jointly to:

Joseph Marion Sanchis, Sanitary Engineer, and John Camp Merrell, Jr., Sanitary Engineering Associate, Dept. of Water & Power, Los Angeles, Calif.

Fuller Awards

The George Warren Fuller Awards made by 24 A.W.W.A. Sections were presented to 25 recipients. Six Sections made no awards during the past year. The list of awardees and the section making the Award is:

Guy Austin Rhoads (Arizona)
Samuel Brooks Morris (California)
Walter Elwood MacDonald (Canadian)
Abel Wolman (Chesapeake)
Abel Fernandez y Simon (Cuban)
William J. Downer (Illinois)
Thomas Jacquelin Burrin (Indiana)
Jack Jones Hinman, Jr. (Iowa)
Frederick William Sieker (Kansas)
Ross Adam Thuma (Minnesota)
Vance Christopher Lischer (Missouri)
John Wortring Hall (Montana, 1951)
James Robert Cortese (Montana, 1952)
Lorenzo Dow Wright (Nebraska)

Division Officers

W. W. Aultman, Vice-Chairman, Purification — *F. W. Kittrell, Vice-Chairman, Resources* — *N. S. Bubbis, Secretary, Management* — *F. Merryfield, Secretary, Resources*

Richard Henry Ellis (New England)
Richard Evanson Bonyun (New Jersey)
Wallace Tiffany Miller (New York)
George Samuel Moore (North Carolina)
Ferdinand Peter Fischer (Ohio)
Frederick David Jones (Pacific Northwest)
Earle Phillips Johnson (Pennsylvania)
Nathan Meredith de Jarnette (Southeastern)
Lloyd Clayton Billings (Southwest)
Herman Walker Snidow (Virginia)
Albert Ernst Hintz (Wisconsin)

Section Awards

The Kansas Section was awarded the Hill Cup for highest point score in membership growth during 1951.

The Cuban Section was awarded the Henshaw Cup for highest percentage of members in attendance at its annual meeting during 1951.

The Old Oaken Bucket was again awarded to the California Section for having the largest membership.

Technical Session Reports

Beginning in the July issue, *Water & Sewage Works* will publish reports of the papers presented in the technical sessions at the Kansas City Conference.

Fred Ohrt

Edw. J. Morgan

Fred. Ohrt Leaves Honolulu Water Board

His Successor, Edw. J. Morgan

Frederick Ohrt, well known in this country as Manager and Chief Engineer of the Board of Water Supply, Honolulu, Hawaii, has resigned this long-time-held position to become full time trustee of the sizeable estate of James Campbell, wealthy landowner of Hawaii. He had been chief engineer of the Honolulu Board of Water Supply for twenty-seven years.

Fred Ohrt, a native Hawaiian, was graduated by Cornell Univ. in 1911. He went back to Hawaii in 1913 and worked his way up to the position of Chief Engineer of the then newly organized Sewer and Water Commission of Honolulu in 1925. In 1930 he was made Manager and Chief Engineer of the Board of Water Supply, which absorbed the Sewer and Water Commission.

In addition to his professional work, Fred Ohrt was well known for his active interest in civic affairs as well as the successful endeavor to get a retirement and pension plan established for Hawaii's governmental employees, in addition to the civil service plan installed as the result of his efforts. In 1951 he was made an Honorary Member of the Am. Soc. of Civil Engrs. in recognition of his achievements in water supply developments and conservation of water. He has for some years been a regular attendant at A.W.W.A.'s annual conventions.

Mr. Ohrt's successor is Edw. J. Morgan, a civil engineer who has been connected with the management of the Honolulu system for more than twenty years. He, too, is a native son and a graduate of the Univ. of Hawaii.

Hydraulic Engineers Wanted by U. S. Army

The Corps of Engineers, U.S. Army, has need for several hydraulic engineers to serve in connection with stream and flood control programs in the states of New York and New Jersey. The need is stated to be urgent.

Starting salary for these positions is $4,205 per year, with other benefits available to civilian employees of the Army Corps of Engineers.

For additional information get in touch with the Personnel Branch (A. J. Rizzo, Chief) U.S. Army Engineer Corps, 80 Lafayette St., New York 13, N.Y.

Francis Friel Appointed to Penna. Registration Board

Francis S. Friel, a member of A.S.C.E.'s Board of Direction and president of Albright and Friel, Engrs. of Philadelphia, has been appointed a member of the State Registration Board for Professional Engrs. by Governor John Fine of Pennsylvania.

Mr. Friel just a short time previously was appointed a member of the U.S. Executive Committee of the International Commission on Large Dams.

We venture the opinion that Frank Friel is receiving credit where credit is due, as attested by these career appointments.

Truett Garrett, Jr. Joins Father in Engineering Firm

M. Truett Garrett, Jr., who recently joined the staff of the Garrett Engineering Co., to become another father and son team in the engineering field, has been notified by Massachusetts Institute of Technology's post graduate school that the doctor's degree in sanitary engineering has been conferred upon him.

Dr. Garrett, who is a graduate of the Air Force Pilot Training School and 2nd Lieut. Reserve, spent four years of graduate study at M. I .T., receiving the Master of Science Degree in June, 1949 and now the Doctor of Science degree. In 1948 he received the degree of Bachelor of Science in civil engineering at Texas A. & M. College. His four years of research at M. I. T. was devoted to water and sewage treatment.

A native Houstonian, Dr. Garrett is the son of M. Truett Garrett, Sr., founder and president of Garrett Engineering Co., which has directed the engineering of many sanitary and water projects, municipal improvement districts and private. Is "Dad" proud of his new associate—well, you should just see his expression.

Olson Joins De Leuw, Cather & Company

De Leuw, Cather & Company, Chicago, Ill., has announced that Axel O. Olson, formerly Chief Engineer of the Public Utilities Commission, City and County of San Francisco, has joined the company.

Mr. Olson will be Western Manager with offices at 79 McAllister Street, San Francisco 2, California.

A.W.W.A. Sending Jordan to International Water Conference

The Board of Directors of the Am. Water Works Association voted to send Secretary Jordan to the Second Congress of the International Water Supply Assn. which is to be held in Paris June 9-13, 1952.

A.W.W.A. does not participate officially in the relatively young International Water Supply Assn.; therefore, Mr. Jordan's attendance at its Second Congress will represent only a good will gesture on the part of the American Association, now almost 10,000 members strong.

Since this trip abroad was considered as a long deserved vacation for Secretary Jordan, in addition to the good will gesture, Mrs. Jordan will accompany him, and we wish both a very pleasant voyage and a happy experience.

Kirn of Waukegan Wins Maintenance Award

Matt Kirn, Supt. of the Waukegan, Ill., Sewage Treatment Plant, a unit of the North Shore Sanitary District, is the proud 1952 winner of the Harry E. Wilson Memorial Award which annually goes to the plant manager considered to have "the best maintenance record for the year." The award is made by the State Sanitary Water Board of Illinois and is greatly coveted by Illinois plant operators. The trophy was established in 1946 by the Bloomington-Normal Sanitary District.

Credited with making the winning of the award possible were the following operators of the Waukegan plant: Joseph Debevic, Joseph Drassler, John Froelich, Anton Potochnik and Vincent Rose.

"Bill" Wise Made Director State Water Comm. of Conn.

Wm. S. Wise, for a number of years connected with the State Water Comm. of Connecticut as chemist and other capacities, has been made Director of the Commission, which promotion became effective May 1, 1952.

Anderson of North Shore District Receives Recognition

Raymond E. Anderson, chemist and engineer of the North Shore Sanitary District of Illinois, has been cited by the State Sanitary Water Board of Illinois "for his outstanding efforts and activities relating to prevention, abatement and control of stream pollution." This award takes the form of a scroll bearing the citation for some especially praiseworthy undertaking in the field of pollution abatement.

"Bill" Riddle Joins Chas. A. Haskins Engineers

The firm of Charles A. Haskins, Consulting Sanitary and Hydraulic Engrs. of Kansas City, Mo., has announced that William G. Riddle is now associated with this well known midwest engineering firm established in 1922.

"Bill" Riddle, notwithstanding the accompanying picture, is not a screen idol masquerading as a sanitary engineer. His roots are in Oklahoma where he earned an A.B. degree at the University of Oklahoma but turned to Oklahoma A. & M. College for a B.S. degree in Civil Engineering.

Upon becoming a full-fledged engineer, "Bill" joined the State Health Dept. of Oklahoma. Six years later (1945) he joined the firm of Burns and McDonnell, Cons. Engrs. of Kansas City, from which he has resigned to become associated with the Chas. A. Haskins firm. He is an associate member of the Am. Soc. of Civil Engrs., and member of the Nat'l Soc. of Professional Engrs., the Am. Water Works Assn., the Federation of Sewage and Industrial Wastes Assns. He will specialize in water, sewage and industrial wastes.

Mr. Haskins, practicing under his own name since 1922, is a Univ. of Kansas graduate (C.E.) and former Chief Engr. of the Kansas Dept. of Health. In World War I he served in the Army Sanitary Corps with rank of Captain. He is a Life Member of A.S.C.E. and member of numerous other professional organizations.

Clyde Kennedy is Dead

Clyde Charles Kennedy, 71, prominent West Coast consulting engineer, passed away April 25 after a short illness. Mr. Kennedy was senior partner in the Engineering Office of Clyde C. Kennedy in San Francisco, which he established 35 years ago. His office is being carried on by his sons, Richard and Robert, who have been partners for several years. Widely admired, he was known as the dean of Sanitary Engineers on the Pacific Coast. His home was in Los Gatos, Calif.

Mr. Kennedy was born in Rushville, Indiana, April 1, 1881, and attended Friends Academy, Spiceland, Indiana, received an AB at Earlham College, Indiana, and an MS at University of California. He served as a captain in the Sanitary Corps in World War I. He was a life member of the American Society of Civil Engineers, a member of American Water Works Association, American Association for the Advancement of Science, and California Sewage Works Association, a founding member of the Federation of Sewage Works Associations, a Fellow in the American Public Health Association. As a Quaker he was long a trustee of Whittier College, California.

Many of the major water and sewage treatment projects in the West were designed under Clyde Kennedy's direction. San Francisco's recently completed North Point and Southeast Sewage Treatment Plants and the older Golden Gate Park Plant are prominent local examples. His sewerage projects have also included Tacoma, Washington; Phoenix, Arizona; and Sacramento, Pittsburg, San Leandro and Stockton, California. Water supply projects have included Phoenix, Arizona; and Eureka, Calistoga and Novato, California. During the war numerous projects were carried out, the largest of which was the Naval Supply Depot at Clearfield, Utah.

He is survived by his wife, Mabel Roberts Kennedy, two sons, three daughters and fourteen grandchildren.

Hardness Reduction vs. Removal
A Critical Evaluation

by T. E. LARSON, *Head of Chemistry Sub-Division, Illinois State Water Survey, Urbana, Ill.*

IT IS universally recognized that municipally softened water is wholeheartedly approved by the consumers where such water is provided. It is a fact that such water can be further improved for specific purposes. But even zero hardness water is not ideal, and other types or forms of treatment are required. The purpose and desirability of providing municipally softened water are economically justified and desirable, just as are the purpose, desirability and even the need for further "polishing up" or "finishing" treatments for specific applications of such water.

The water treatment industry still has much to do in order to provide an acceptable product to the major percentage of the population. Municipal hardness *reduction*, home service and home owned hardness *removal*, and synthetic as well as soap detergents are here to stay. No one of these practices will replace another, but all supplement each other in general water treatment. Recognizing this fact, we may orient our thinking on water treatment for the individual by summarizing some data regarding water consumption in the United States and providing particular reference to water treatment in Illinois.

United States

In 1945 there were 15,400 water works plants supplying approximately 94.3 million persons, or about 70 per cent of the 1940 population, with an average of 127 gallons per capita per day. Currently it may be estimated that there are 16,500 plants in the United States.

A census in 1945 also indicated that there were some 665 municipal softening plants supplying 12 million people, or approximately 9 per cent of the total population of 1940. Currently, it has been estimated that some 15 million persons are provided with municipally softened water, or approximately 10 per cent of the 1950 population.

In addition, it has also been estimated that there now are approximately one million privately owned softeners supplying approximately 3.6 million persons, or 2.3 per cent of the total population, and 900,000 soft water services supplying 2.1 per cent of the population. Therefore, if these percentages may be totaled, it would appear that some 14.4 per cent of the population is provided with soft water by treatment; or on the basis that treatment is provided only in hard water areas, 20 per cent of the 112.5 million people living in these areas are provided with soft water treatment.

Illinois

Illinois is classed as a hard water state. A recent publication, Circular No. 31, issued by the Illinois State Water Survey and titled "Mineral Content of Public Groundwater Supplies in Illinois" has shown that 88.7 per cent of these groundwater supplies have a hardness greater than 200 parts per million. (Table I). Only 17 per cent of these are municipally softened. A little less than 50 per cent of the supplies have a hardness greater than 325 ppm., and 22 per cent of these supplies are municipally softened. It is interesting to note that only 24.6 per cent of the 61 supplies which have a hardness greater than 500 ppm. are municipally softened.

Table I
MUNICIPALLY SOFTENED HARD WATER SUPPLIES IN ILLINOIS

Hardness	Percent of 532 Supplies	Percent of These Supplies Softened
201 ppm. or more	88.7	17.0
251 ppm. or more	77.8	17.4
301 ppm. or more	60.2	20.2
326 ppm. or more	48.7	22.4
351 ppm. or more	41.6	22.8
401 ppm. or more	27.0	25.2
501 ppm. or more	11.5	24.6

No data are available on the extent of softening for *surface* water supplies. However, with the exception of supplies obtained from Lake Michigan, the median hardness for surface water supplies is approximately 300 ppm.

The extent to which the general public desires clear, soft water is perhaps no better exemplified than by the fact that $1.35 to $4.05 per thousand gallons is currently being paid for soft water service on supplies having 200 ppm. and 600 ppm. hardness, respectively. This cost is in addition to the cost of purchase of the particular municipal water of such quality as is provided. These costs for municipal water range from 35 cents to approximately $1.50 per thousand gallons and in no case is the water delivered with a hardness less than about 60 ppm.

A questionnaire sent to home service operators in Illinois showed, Fig. 1, that no operator provided service to more than 50 per cent of the population in the city served. Four oper-

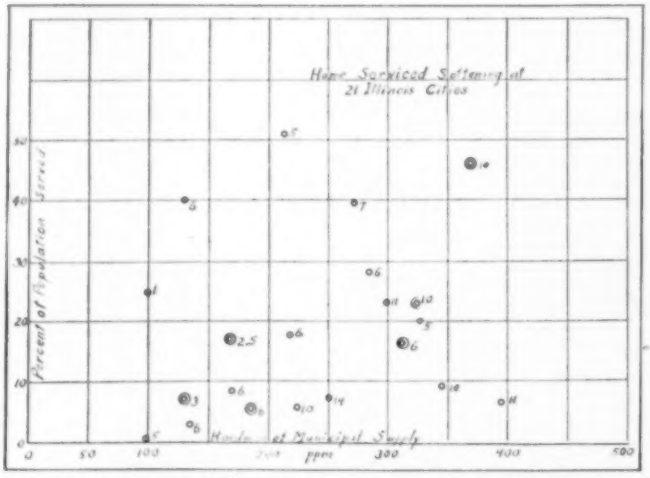


Fig. 1—Water softening by home service operators in 21 Illinois cities. Data show no evident relation between hardness and population served.

This paper is a revision of one presented by the author before a meeting of the National Assn. of Water Conditioning Equipment Manufacturers.

ators, after ten years, provide service to less than 10 per cent of the population. The number of years in business are indicated numerically at each point in Fig. 1. The double circles represent operators who have no competition in their community. It appears that it makes little difference whether the hardness of the city supply is 100 or 400 ppm., home serviced softening can be made desirable. No data were available on the funds used for increased capital expenditures and for advertising.

Residential Use

A recent publication[1] by Larson and Hudson of the Illinois State Water Survey staff has provided a detailed analysis of residential water use as compared with family income. These data on 15 Illinois cities of population ranging from 900 to 900,000 show a per capita residential use of 21 to 52 gallons per day for family net buying incomes of $2,000 to $7,500 per year respectively.

If complete sanitary facilities were available to the lower income residences, it was estimated that the $2,000 income residential use would be increased to 37 gallons per capita per day.

No correlations were found between residential use and size of community, water rates, pressure, use of meters, or quantity or quality of the water supply. The hardness of these supplies ranged from 125 to 313 ppm., and the iron content from 0.0 to 0.5 ppm.

These data should be of particular value in the general design of completely soft water service for full line installations as well as for hot water installations, but should be used with great caution for specific individual installations.

The quantity of "completely soft" water provided by 28 day service is shown in Fig. 2 for different family sizes and with different family incomes when provided with waters of specific hardness.

A family of 3 can obtain completely soft water for all its requirements if the city water has a hardness of 100 ppm. If 60 ppm., a family of 5 can so be serviced. A family of 4 can be provided with its soft water requirements only when the hardness is 250 ppm. and only a family of 2 can obtain such service if the hardness is 450 ppm. With 40,000 grains per exchange, the values of hardness in Fig. 2 would be doubled.

Municipal Softening

It would be rather pointless to discuss in detail the cost of providing municipally softened water at this time, since this has very ably been indicated by L. R. Howson[2]. Suffice to say that his conclusions state: "Reduction in hardness down to 5 grains per gallon can most economically be made available to the greatest number through softening of the municipal supply, and for those who wish completely softened water, the individual softeners are the best solution." In addition, it might be pointed out that municipally softened water benefits those in the lower income bracket more than those in the middle or high income bracket since the net savings obtained thereby are less frequently supplemented or accomplished by the aid of home softeners.

This is borne out by the fact that a recent survey by one of the soft water service companies has indicated 27 per cent of the services are provided to high income families (6 per cent of the spending units, buying income greater than $7,000/yr.); 57 per cent of the services are provided to the middle income families (64 per cent of the spending units, buying income $2,000 to $7,000/yr.); and 16 per cent of the services are provided to the low income families (30 per cent of the spending units, buying income less than $2,000/yr.).

Only the misinformed can deny these conclusions and the fact that no water is ideal in quality for every purpose. It is for this reason that there are so many different "finishing" or "polishing up" treatments currently in use by industries, as well as by private consumers, for the many various purposes for which water is used.

It is indeed unfortunate that discussions on the relative merits of municipal softening and home-owned or home-serviced softening frequently are biased, and thereby prove to be harmful to the proponents of both sides.

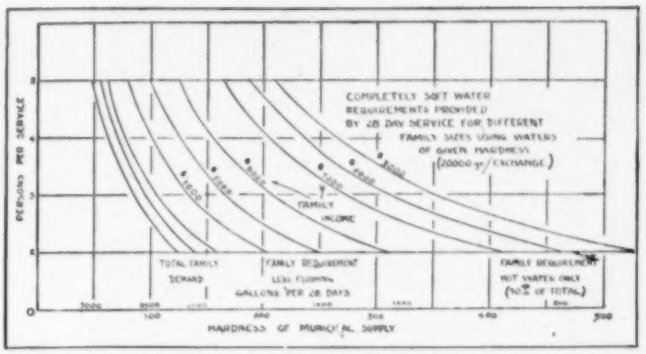

PERSONS PER SERVICE
COMPLETELY SOFT WATER REQUIREMENTS PROVIDED BY 28 DAY SERVICE FOR DIFFERENT FAMILY SIZES USING WATERS OF GIVEN HARDNESS (20000 gr/EXCHANGE)
FAMILY INCOME
TOTAL FAMILY DEMAND
FAMILY REQUIREMENT LESS FLUSHING
GALLONS PER 28 DAYS
FAMILY REQUIREMENT NOT WATER ONLY (NOT % OF TOTAL)
HARDNESS OF MUNICIPAL SUPPLY

Fig. 2—"Completely soft" water provided by 28-day home service. Hardness of municipal supply related to family size and income.

A careful analysis of the overlapping factors indicate that each treatment supplements the other for the ultimate benefit of the user. Home softening finishes the job of providing a completely soft water which is started by municipal softening. Municipal softening (hardness *reduction*, if you please) provides more hardness reduction per householder's dollar than *any other* method and reduces the hardness to a point where the home-owned and home-service softeners (or hardness *removal* units) can handle more water for a lesser cost.

A strong educational program is in order to inform the home unit operators whether home-owned or home-serviced, of the very definite advantages of municipal softening. Likewise, an equally strong educational program should be established for the proponents of municipal softening to insure that their discussions indicate municipal softening *reduces substantially* but *does not eliminate* hardness.

It should be pointed out that municipal softening not only removes the major proportion of the ingredients which are responsible for hardness in the water supply but also removes color, odor, iron and manganese, all of which are of important nuisance value to the serviced soft water operators and to home owned softeners.

Corrosion Problem

It is entirely impractical to completely soften water on a municipal basis, since its resultant effect on the distribution system and the effect of the system on the quality of the water would thereby both be detrimental. For transportation and distribution municipally softened water can economically be made relatively noncorrosive, which is one thing that cannot at the present time be said for

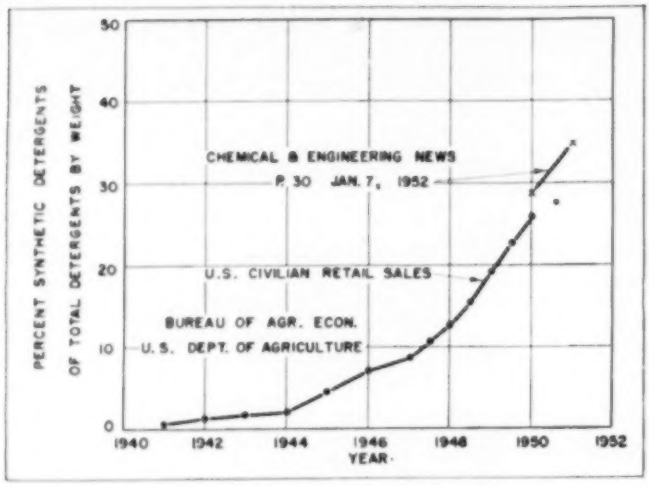

PERCENT SYNTHETIC DETERGENTS OF TOTAL DETERGENTS BY WEIGHT
CHEMICAL & ENGINEERING NEWS
P. 30 JAN. 7, 1952
U.S. CIVILIAN RETAIL SALES
BUREAU OF AGR. ECON.
U. S. DEPT. OF AGRICULTURE
YEAR

Fig. 3—Rate at which synthetic detergents displace soap.

completely softened water. Municipal water (softened or not) is never made non-corrosive by complete softening. If relatively non-corrosive before complete softening, such treatment may cause the water to become corrosive (or less protective). If corrosive before complete softening, water will become no less corrosive but probably more corrosive (again less protective) by such treatment.

Proper municipal softening practically eliminates the tendency for water to form scale deposits. These deposits are responsible for burned spots in water heating where direct fire is applied on the opposite side of the metal. Complete softening removes all scale forming tendencies and also renders the water less protective.

Complete softening, therefore, presents a major problem—a problem which water works technicians have wrestled with for over 100 years. The problem has become more acute in recent years with the development and use of small high capacity water heaters. By and large, proper proportioning of hardness, alkalinity and pH offers the best general solution; but specific uses and after treatments frequently can destroy all efforts previously made by the "wholesale" distributor. It is significant that the National Association of Soft Water Service Operators is devoting particular attention to this problem from the standpoint of providing a non-corrosive water to the consumer as a service as well as reducing maintenance and replacement costs on their own equipment.

Soap and Synthetic Detergents

Although the majority of the objectionable constituents have been removed, municipally softened water obviously still leaves something to be desired when used for particular purposes. Additional "polishing up" treatment is advantageously provided for some purposes by use of soap or synthetic detergents with or without the use of serviced or home-owned softeners. By comparison, either soap or synthetic detergents may be of greater advantage for different water qualities and for specific purposes.

Even among the many synthetic detergents, some are better for specific purposes than others. No synthetic detergent has been found to be an improvement on the use of soap with completely soft water for the purpose of washing cottons and linens. Beauty shop operators are thoroughly sold on completely soft water, regardless of whether the shampoos are made from special soaps or synthetics. On the other hand, synthetic detergents have proven to be of particular value for washing woolens, nylons, silk, and, to a large extent, dishwashing even in hard water.

A word of caution may be of value at this point. In the study and interpretation of comparative test data on the effectiveness of soaps and synthetic detergents for various uses with various waters, particular attention must be given to the conditions of the test and the methods of evaluation of the results. For example, reliable authorities on detergency have long known that foam height is not a measure of detergency power. In recent years, secondary "experts" are also recognizing this fact and currently many of the consumers are becoming so educated. However, foaming ability is still, altogether too frequently, being cited as the criterion of relative detergency efficiency. The factors involved are so numerous that laboratory tests must be considered as indicative only under specific conditions and then only on the basis of end results on repeated representative washings.

An example of one factor of water composition lies in the alkalinity and

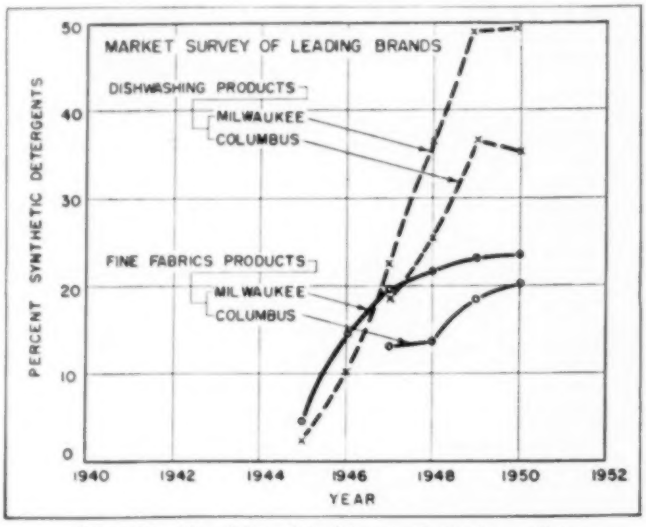


Fig. 4—Rate of household synthetic detergent utilization in two cities.

pH of the water used. It is possible that a superior detergent for water of zero hardness, 50 ppm. alkalinity and pH 8.0 may not be superior for a water with zero hardness, 300 ppm. alkalinity and pH 8.0, and even less so if the latter water had a pH of 7.0. The acidic or neutralizing properties of free CO_2 and of sodium bicarbonate do not appear to be fully recognized in all of the laboratory tests now being reported.

The extent to which synthetic detergents will be further developed for specific applications is difficult to determine, since the industry is still in a growing stage. It is significant, however, that synthetics continue increasingly to displace soap in retail detergent sales. See Fig. 3. In 1951, 35 per cent of the retail sales of detergents on a pound basis were synthetic detergents.

On the other hand, a market survey[3] of leading brands of products sold for dishwashing and products sold for washing fine fabrics in Milwaukee and in Columbus, appears to show that the synthetic market in these two cities has leveled off. See Fig. 4. However, it would be wise to reserve opinion until at least one more year of confirmatory data has been obtained. As a sidelight, it is interesting to note that 35 per cent of the detergents used for dishwashing in Columbus were synthetics, whereas in Milwaukee (where the hardness is 130 ppm., compared to 85 ppm. in Columbus) 50 per cent of the detergents used for dishwashing were synthetic.

General Futility of Cost Discussions

It would be possible to discuss extensively the many uses and specific treatments for utilizing each of the many possible qualities of water. It is rather pointless to discuss the economics of such treatment from a cost of chemicals standpoint, since the chemical cost for iron removal, for instance, is often zero and the chemical cost for making distilled water is often zero; and, omitting any consideration of investment in capital equipment and maintenance, the cost of iron removal is practically negligible, whereas the cost of distilled water may be as high as $90 per thousand gallons. And think of the bonanza of canned drinking water at 15 cents for a 10.5 ounce can—$1,830 per 1,000 gallons.

The important conclusion that can be drawn from these data is that *Service* and *Quality* of product are the keys to the purse strings controlled by the American housewife.

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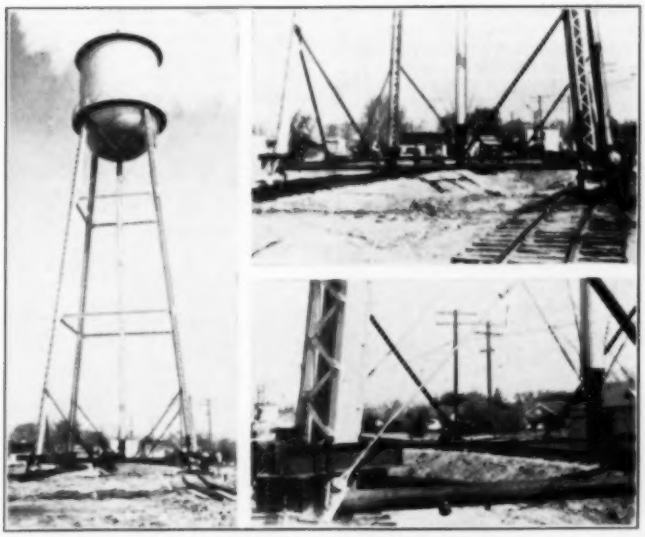
2. Howson, L. R. Economics of Water Softening. *Journal A.W.W.A.* 43, 253 (1951).
3. McCutcheon, J. W. Soap and Sanitary Chemicals. 26, 85 (1950).



How Lovell's Tank Was Moved About 700 Feet

"Taken for a Ride"

The Later Day Saints (Mormon) Church bought the land on which stood the water tank of Lovell, Wyo. It became necessary to move the tank about 700 feet so that a new church could be built.

Many doubted that the tank could be moved without dismantling it, but the Taggart Construction Co. undertook the hazardous operation of moving the 35 year old tank in upright position. The operation was a success. This is how it was done without damage or mishap.

A few diagonal braces were welded to the legs of the tank. Two railway tracks were carefully laid to the new location of the tank. Hydraulic jacks were used under each leg to lift the tank and place each leg on dollies on the tracks.

Guy-lines were placed high up on the tank to prevent it from tipping over in case of mishap or high wind. The tank was pulled along the tracks with the aid of a winch-truck a few inches at a time. For the people of Lovell the operation proved to be a source of much speculation and interest.

To Frank Pendleton, water plant, operator of Lovell, Wyo., our appreciation for the photograph and information used in this story.

Fire Plugs to Calm Canine Nerves

The following news item sent out over A.P. wires from Toronto calls to mind a certain cartoon which appeared in an earlier issue, wherein a water customer was dickering with a water-works employee concerning the proposed purchase of a discarded fire hydrant for planting in his back yard for the peace and comfort of his pooch.

The item in question follows:

"Where do all the old fire-plugs go? Why not to the dog kennels?

"In Toronto that's where many of them are going, for the Humane Society here has taken over the city's cast-off fire hydrants and is installing them (minus water connection) in its outdoor dog kennels.

"An official said that the fire hydrants are being installed to calm the canine nerves which may be upset due to the lack of familiar objects and surroundings."

There is no such thing as a big job. Any job, regardless of size, can be broken down into small jobs, which when done, complete the larger job. —*Walter Chrysler.*

Atlanta's Water Improvement Program

Involves $10,000,000 Expenditure in Two Stages.

As explained to FRANCES SATTERFIELD *by* PAUL WEIR,
Genl. Mgr., Atlanta Water Dept.

THE growth and progress of Atlanta has been constantly in the news the past several years, and has been one of the main factors in some of the nation's large industries turning their eyes Southward. If a city is to continue to expand, so must its water supply system, and few cities can claim greater advance in a similar period than Atlanta.

"In the last four years," Paul Weir, head of the Atlanta system, said, "our system has increased in size almost 25 percent. Instead of buying one car load of six inch pipe a week, for instance, we are now receiving seven—and we use a car load of copper and copper fittings a month. Also, we have been installing from 700 to 800 fire hydrants a year."

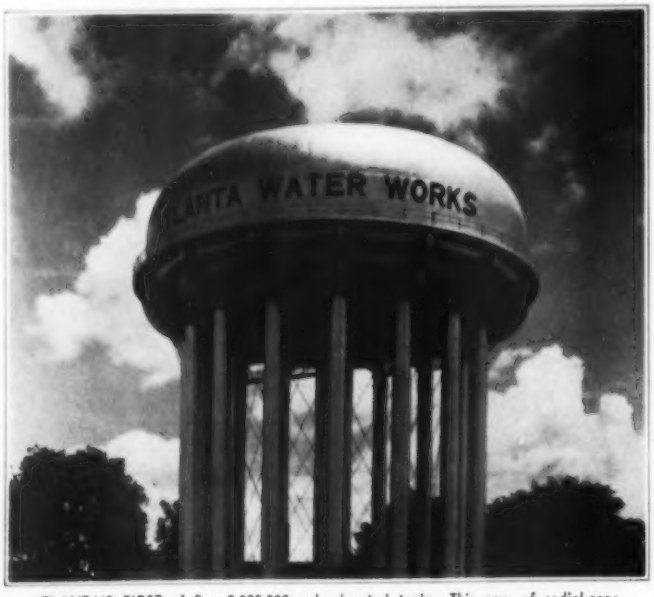
Five 2MG. Tanks Scheduled

The most outstanding of the recent developments, however, has been the erection of a new two million gallon storage tank which was completed and put into operation in May. The erection of this tank was the result of load studies carried on by the department. "We found that we needed about 10 million gallons of water storage capacity on the system to level off our pumping," Mr. Weir said. "This new tank is the first of five we plan for the future. They will be placed at intervals around the fringe of the old city limits."

Mr. Weir explained that the distribution system of a water works is like the arterial system of the human body. As the human body is examined and studied for weaknesses, so is the distribution system. The Atlanta Water Works is constantly making load studies. These studies show where people are and how much water they consume from three different standpoints—in the home, in small shops, and in heavy industry. They not only take into consideration the present uses, but also the future needs. The experts handling these studies also work in close co-operation with the Metropolitan Planning Commission.

Emergency Jetty—1951

Drought necessitated emergency measures. In the dwindling Chattahoochee River this stone jetty, hurriedly constructed, saved water rationing in Atlanta by raising level and throwing river flow to the intake. A 90 ft. boom hoist on a steam messenger cable was used for placing the 1,000 to 3,000 lb. blocks of stone in the jetty. Atlantans never realized how close they came to going bathless.



ATLANTA'S FIRST of five 2,000,000 gal. elevated tanks. This one, of radial-cone Horton design is 102 ft. in diameter with a 35 ft. range between upper and lower water level.

"Pressure Watchmen" Reveal Conditions

Atlanta is one of the few cities with 7-day chart recording pressure gauges installed throughout its entire water system. These are invaluable in making the studies, which are implemented by the services of The Pitometer Company of New York.

"These pressure charts are like the wheel of a wagon," Mr. Weir said. "When the recorded line stays round, we know that we have an adequate water supply. When it zigzags and becomes tooth-edged, we know we don't. We use an average of 55 million gallons of water a day, and this past summer we have been using 73 million gallons a day—hitting 105 million at peak hourly rates."

$10,000,000 Betterments in Two Stages

"Recently an additional 82 square miles was voted into the Atlanta city limits, and preliminary surveys have shown that it will cost between 5 and 10 million dollars to give the new area service comparable to that in the previous city limits. Of course we cannot do everything at once, so we

NEW SHOP for distribution repair and maintenance—automotive repair entrance.

plan the changes in two projects—first will be the immediate replacement of 100 miles of galvanized pipe lines with six inch mains. In addition," Mr. Weir continued, "many fire hydrants and feeder mains must be changed. This will cost $5 million. This reinforcement is mainly to afford adequate fire protection—the ultimate aim of any system. The second part of the program will incorporate the additional storage tanks."

Atlanta has four large feeder mains from the pumping station to the distribution area and is now letting bids for a fifth which should be ready before the 1952 summer load comes on the system. This will be Atlanta's first steel main. It will be 48 inches in diameter and will extend 6,100 feet from the pumping station to the west, thereby supplying a section greatly in need of better facilities. The installed cost will be $85 a foot, with the first section costing $550,000. When this arterial main is complete, it will represent an expenditure of $1,500,000.

A $40,000,000 Property

The Atlanta Water Works is now a $40,000,000 municipal water utility system. Since 1945 it has expended $8,500,000 in system improvements and other projects. In 1945 the department had 39 pieces of construction equipment which operated 3,700 miles annually. This year it has 80 construction units, and will operate 4,600 miles.

Atlanta is spending from one to one and a half million dollars a year in capital investment in reinforcing the water supply system. It produces a finished product—WATER—which at existing rates would sell for $6,000,000 annually. But unfortunately the water department receives no money for water valued at $1,000,000 which is supplied to various agencies of the city and county governments.

Ed. Note: This article was an experiment, in which Frances Satterfield, a technical reporter, was assigned the job of interviewing Paul Weir, red headed live-wire Gen'l. Mgr. of Atlanta's Water Dept., and developing a story. Our readers will recognize the newspaper style of recording the interview—but, it's not bad and is guaranteed as to accuracy by Mr. Weir, too busy to write the story himself.

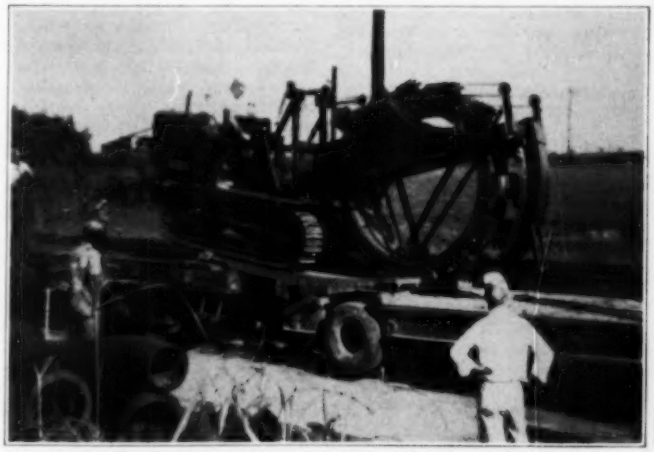
Modernization Has Paid

The system has 85,000 customers who are serviced by 400 department employees in six divisions. It is one of the most completely integrated systems in the country. This close co-operation is brought about in large part by regular executive staff meetings held every two weeks. Of tremendous help is the IBM billing system which enables the executives to know how many gallons of water are used each month, and how much in each district.

At present there are 900 miles of pipe lines or water mains in the Atlanta system carrying the water from the source to the customer-citizens. There are 450,000 people in the original 36 square miles of the municipality. In the new area of 82 square miles are 100,000 persons. Therefore, there is now a total of 118 square miles in the city, and a population of 550,000. The system will still serve 80 additional square miles (50,000 people) outside the city. In other words, the Atlanta Water Works will be serving a total area of 198 square miles, and 600,000 persons.

Financing the Hard Way

In spite of its progressiveness, and the tremendous strides being made, the system is not without its problems. According to Genl. Manager Weir, one of the major problems is financial. All of the water works income goes into a common treasury. As a result, the department has to get operating funds the hard way—by begging them back. Mr. Weir feels that water works finances should be entirely independent of other municipal operations, but this is a matter requiring State legislative action. In the meantime, the Department works on a water revenue certificate basis which permits it to issue certificates for improvements in amount not exceeding 20 percent of the annual income.



NEW CLEVELAND TRENCHER—one of three used on $5,000,000 distribution improvement project.

New York AWWA Section—
Report of Syracuse Meeting

Chairman
R. W. Austin
Hyde, Engr., P.S.C.
Albany, N.Y.

Vice-Chmn.
John G. Copley
Gen. Mgr., Water Bd.
Elmira, N.Y.

ON April 17-18, 1952, the New York Section AWWA held its spring meeting in Syracuse. The program presented included technical papers, a round table conference, and social events. Chairman Robert W. Austin presided, and Chas. H. Capen, Vice-Pres. of the AWWA, was the banquet speaker.

At the luncheon and business meeting on the first day, Mayor Thos. J. Corcoran of Syracuse described the policy of his city as one of maintaining a "community" water supply. Within the city and in adjacent suburbs, he pointed out, both residential and industrial needs for water are growing. The city proposes to enlarge its facilities in accordance with the need. Water rates outside the city are, however, approximately 1.5 times higher than those applying within the city.

John M. Diven, chairman of the membership committee, announced that there are now more than 700 members in the New York Section.

Capen Describes Growth of Water Needs

Mr. Capen traced briefly the development of man's varied, and ever increasing, needs for water: first, as a means of transportation; then, as a means of industrial power; and, finally, as potable public water supplies. It is impressive to realize that industry today uses about 50 per cent of the amount of water provided for potable purposes. In addition, industry uses great volumes of processing and cooling waters.

Percentage use of total water consumption in New York state, for example, is: rural, 1 per cent; municipal 10 per cent, and industrial 89 per cent. New York state ranks first in volume of water used for power and Kentucky, with its TVA consumption, is second. Mr. Capen emphasized the need for water works men to work closely with industry in developing the water utility.

A cocktail hour preceded the banquet and a social hour followed it—both events being provided through the courtesy of the Water and Sewage Manufacturers Assn., Inc.

Miller Recipient of Fuller Award

The Fuller Award Committee selected, as recipient of the Section's Award, Wallace T. Miller, General Manager, New York Water Service Corp., Rochester Division, Rochester, N.Y. He was cited for his wholehearted service to the section and, in particular, for the formation of water works operator's groups throughout the state. The significance of the award was described by W. W. Brush, who noted the large contributions made to the AWWA by George W. Fuller—early chemist, bacteriologist, and sanitary engineer.

Technical Program

"PRIORITIES AND MATERIALS" is the title of a paper prepared by *Gerald E. Arnold*, Director, Water Resources Div., Washington, D.C., and presented in his absence by *Roy O. Van Meter*, his assistant in the division.

The availability of strategic materials has not changed materially and, hence, controls cannot be reduced. Stainless steel, while in very short supply, is probably adequate for water and sewage needs. The situation in copper, copper base alloys, and aluminum is no worse but is not much better.

No predictions were made for the future, but it does appear that the present represents a transition period: more lenient controls, self-authorization, and other betterments are envisioned by the Water Resources Division. Mr. Van Meter emphasized the need for complete supporting data relating to project essentiality. Requests must be restricted to the amount of material actually needed—and either all of the needed material or more will be allocated.

Conservation potentialities should be investigated. For example, possible savings through a water metering program may reduce water consumption by one-third (and, therefore, one-third of treatment plant expansion). Reduced water consumption is directly related, also, to the volume of sewage to be treated in a community.

Membership
John M. Diven
Jackson Heights
N.Y.

Local Host
Elon P. Stewart
Div. Engr. of Water
Syracuse, N.Y.

Secy.-Treas.
Rollo K. Blanchard
Neptune Meter Co.
New York, N.Y.

Director
Reeves Newsom
Village Manager
Scarsdale, N.Y.

Civil Defense and Mutual Aid Plans

"NEW DEVELOPMENTS IN CIVIL DEFENSE AND MUNICIPAL AID" were reported in a paper prepared by *Earl Devendorf*, Dir., Bur. Environmental Sanitation, State Dept. Health, Albany, and presented in his absence by *Chas. R. Cox*, Chief, Div. of Water Supply.

Mr. Cox explained how the plans for integration of water utilities with civilian defense agencies differ at present from those favored in World War II. In this period of potential danger, it is considered that only 13 danger areas exist in New York state. Therefore, zone coordinators have an entirely different function than in the last war.

Local water works experts should work with local CD authorities. Those representing a water utility should be identified with a local (usually

county) civilian defense group, to function with representatives of comparable services. Development of means of transportation and communication is essential, as mutual aid expediting may be no easy matter. The state CD authority will function through local CD directors, and not directly to water utilities.

The Water Authority

"Water Authorities—Pro and Con" were discussed in a paper presented by *Alexander Russell*, Exec. Secy., Monroe County Water Authority, Rochester, N.Y.

In re-evaluating the pros and cons of water authorities, Mr. Russell termed them "county-wide water districts." They represent an ancient device, and can be traced back to the 1600 period in Great Britain.

Writers have claimed "an authority should be the last resort." It develops often as an easy means of financing a new project; it should never be considered a cure-all to supplant regular means of government; but it does provide a convenient means of crossing governmental boundaries.

The author emphasized that an authority must justify its existence, and must do more than substitute for local utilities. Its essential services are to develop and integrate the conservation of water resources. An authority will be successful if directed by men of good will, not politicians, who believe public office to be a public trust.

Operator Training

"The Training of Water Works Operators," a paper presented by *William T. Ingram*, Assoc. Prof. of Public Health Engineering, New York Univ., termed trained operators a "municipal responsibility." Public water supplies serve more than 90 per cent of the 14 million population of New York state. There are 637 surface and 664 ground water supplies utilized. About one-half (in number) of the public supplies, or 447, provide treated water.

All records demonstrate the essentiality of proper operation of water supplies. Outbreaks of dysentery and typhoid have never been completely controlled, but competent personnel can reduce operating hazards to at least those considered beyond human control. The New York state Sanitary Code requires the employment of qualified operators, and other regulations establish the necessary qualifications. Professor Ingram described these qualifications in some detail.

Training programs are coordinated by the state's Bureau of Environmental Sanitation, and courses are offered in different sections of the state at four technical schools. These include lecture and laboratory training. "On the job training" is available from state, city, county, and consulting sanitary engineers whose work is related to a specific treatment plant. Qualified operators are essential, in addition to the need for adequate treatment works. Such operators show a profit to plant authorities, and it is considered a municipal responsibility to provide qualified operators.

Programmers

William T. Ingram
Assoc. Prof., N.Y.U.
New York

Charles H. Caren
Vice-Pres. AWWA
Wanaque, N.J.

Chas. R. Cox, Chief
Water Supply Sec.
Albany, N.Y.

S. P. Carman
Cons. Engr.
Binghamton, N.Y.

Round Table Conference

The popular round table conference was presented on the last day of the meeting with John G. Copley, Vice-Chairman, presiding, and with S. P. Carman, Cons. Engr., Binghamton, as leader. Enthusiastic participation made evident the interest in topics discussed.

"Water Dousing" brought forth a number of experiences, comments, and questions concerning a new device relating specifically to *Pipe* dousing. This involves the use of one-eighth-inch bronze welding rod bent to swing in a copper tubing handle placed at right angles to the straight rod (as described in an article in the Christmas, 1951 issue of the Mueller Record). While the detection of buried pipe by this device evoked considerable amusement, a favorable report was given by several members who used it very successfully.

Fuller Awardee
Wallace T. Miller
N.Y. Water Service Corp.
Rochester, N.Y.

"Corrosion Control" was discussed from the standpoint of small water supplies having no filtration plants. The growing use of copper services, Electrolysis reduction, and hexametaphosphate treatment were aspects considered under this heading.

"Laboratory Control of Fluoridation Treatment" is a matter of much interest to operators, particularly those who have only limited laboratory facilities and personnel. Mr. Obrien of the State's Div. of Labs. and Research described the technique of the control test and commented on the applicability of standards and commercial test kits. Operator qualifications were discussed, and it was stated that, for fluoride testing, New York State requires training by its laboratory division for this test. In addition, daily samples of fluoridated water must be submitted to an approved laboratory for testing, and frequent check samples must be sent to the state laboratory.

"Public Relation Policies Regarding Fluoridation" were discussed by many members from many points of view. The problems and practices existing in communities now practicing water fluoridation were described by utility officials. The questions and concerns of officials representing utilities which are considering fluoridation were heard. The course of water fluoridation seldom seems to run smoothly. At the city of Elmira, for example, the water utility also serves three townships and one village; all these provided approval to institute treatment. Then, when submitted to the Water Board for approval, considerable opposition developed. The Board is now making a "post card poll" of consumer attitude in an attempt to answer the problem. Factual education and further research appear necessary if the public as well as the technicians are to reach sound decisions.

Municipal Water Supply of Scandinavia

Part III—Stockholm, Sweden

by E. L. KNOEDLER, *Senior Engr., Sheppard T. Powell, Engrs., Baltimore, Md.*

THE water requirements of Stockholm are supplied by two treatment plants. Both plants withdraw water from Lake Malaren which is the principal source of the city's supply. Unlike many American cities, apartments and homes rather than industries overlook the lake. The water department of the city supplies water to nearly 850,000 persons in Stockholm and the surrounding areas.

In the early development of the city, water was withdrawn either from Lake Malaren or from underground aquifers believed to be an old river bed. It was early found, however, that salt water infiltrated into the lake — especially in periods when winds blew from the south and carried water from the Baltic Sea into the lake.

Two Filtration Plants

The Norsborg water treatment plant, placed in service in 1904, has a daily capacity of 42 million gallons. A small portion of the water is taken from Bornsjon, a small lake nearby. This water is used to dilute the water from Lake Malaren when color and salinity of the latter are high. The water at the Norsborg plant is clarified by slow sand filters, treated with lime and chlorinated. Plans are now being formulated to increase the plant capacity by using alum coagulation and rapid sand filtration.

Salt water infiltration became so serious as the water consumption of the city increased that it became necessary to construct a second plant. The new plant at Lovo, shown in Fig. 1, was placed in operation in 1933. Its capacity was increased in 1937 and 1938 and purification methods were improved and modernized. The present capacity of the plant is 32 million gallons per day.

This is one of the most modern of the water treatment plants inspected by the author. The raw water is relatively free from salt infiltration. Further, both supplies have been improved by the construction of a dam which raised the lake level about one foot above sea level. Under normal conditions there is no tide and the increased water level has inhibited the infiltration of salt water. Plans are being made to install a system of locks that will further improve the quality of the raw water.

The treated water from the two purification plants is pumped to the city through dual mains, respectively 32-inches and 40-inches in diameter. There are 620 miles of main piping in the distribution system. In order to equalize the pumping rates throughout the day and to care for peak conditions, the system includes four distribution reservoirs containing a total volume of 15 million gallons. In addition, twenty automatic booster pumping stations increase the pressure in certain parts of the city. One of these stations is shown in Fig. 2.

In spite of the present reservoir capacity, increased consumption has made it necessary to lay plans to increase the storage to 21 million gallons in order to adequately handle peak loads.

The main pipe lines have been constructed of steel and all are wrapped for corrosion protection. One of these installed in 1938 is shown in Fig. 3. In the new installations all welded construction has been employed. Small piping to individual houses is either galvanized or copper, whereas intermediate sizes are either steel or cast iron.

As in most cities, population growth in Stockholm has been rapid since the early 1900's. The water demand has increased from an average of 11 million gallons to 62 million gallons per day. The per capita consumption has changed even more rapidly, increasing from 32 gallons per capita per day in 1920 to 46 in 1930, 61 in 1940 and

Fig. 1—MODERN Treatment Plant at Lovo combines rapid and slow sand filters

Fig. 2—AUTOMATIC Booster Pumping Station—one of twenty on the distributain system

73 in 1947. A per capita maximum demand as high as 106 gallons per day per person has been reported.

The Lovo Plant

A flow sheet, Fig. 4, illustrates the routing of water through the Lovo plant.

Rapid Sand Filters

The water passes through screens before being delivered to a mixing chamber where it is treated with alum. It flows downward over a step aerator used for mixing and then through sedimentation basins arranged in sections at two different elevations. The water flows first through the lower level and then reverses and returns along the upper level. The design is an original one and provides one and one-half hours detention in a relatively small space. In coagulation, 2.1 to 2.8 grains per gallon of alum are used. Although other coagulants have been tried, alum appears to give the best results. Sedimentation takes place in four tanks 13 to 20 feet deep, operating in parallel, and provided with false bottoms at half tank depth. The settled water is next delivered to rapid sand filters. Four minutes backwashing of the filters every 24 hours is employed, which is comparable to American practice.

Fig. 3—INSTALLATION of Main Pipe Line. New Installations Employ Welded Construction

The filters are constructed with a supporting bed of gravel and 28-inches of sand bed. New filters have 47-inches of sand and rest on false bottoms of concrete fitted with copper strainers. Each unit has an area of 375 square feet and there are 24 filters on each side of the filter house. The filters are provided with wash water troughs which discharge into a central trough dividing the filter into two unit sections, and include a surface wash system supplementing the normal backwash flow. The surface wash rate is about 3.5 g.p.m. per sq. ft., whereas the normal backwash water is delivered to the filters at the rate of about 15 g.p.m. per sq. ft. However, the amount of wash water varies, according to the temperature of the water, over a range of 50 per cent.

Slow Sand Filters

Large water works propeller pumps, shown on Photograph 14, lift the filtered water to slow sand filters for final polishing. On Photograph 15 may be seen the slow sand filters and some of the homes provided for workers who live near the plant.

There are ten slow sand filters, each having an area of 2350 square feet. The flow through the beds is at a rate of only 7.5 gal. per *hour* per sq.

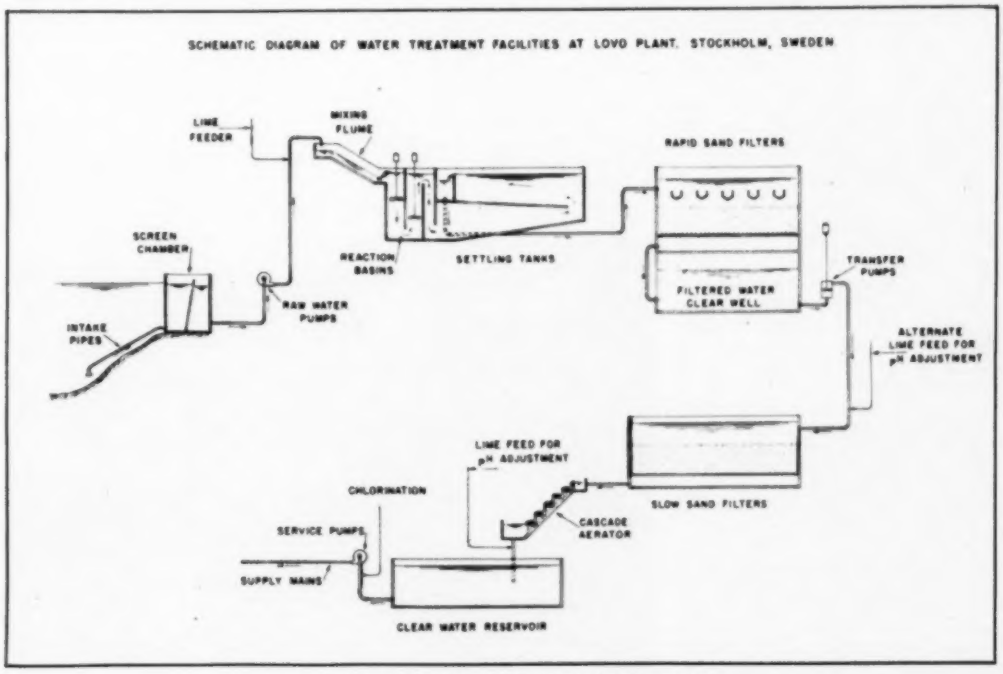


Fig. 4—FLOW DIAGRAM OF LOVO TREATMENT PLANT

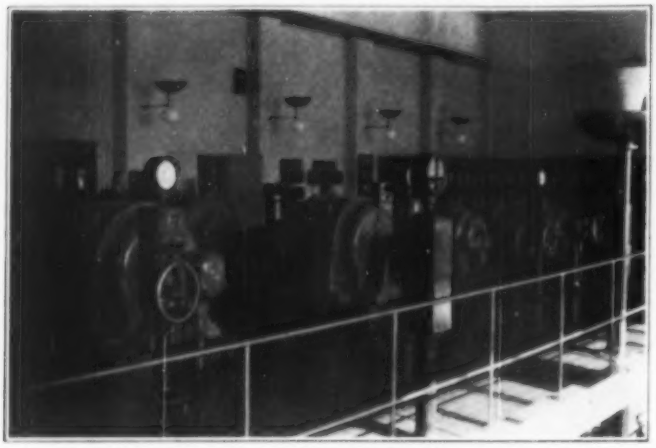


Fig. 5—PUMPS Supplying Slow Sand Filters—Previously Filtered Water is Polished

ft., compared to a rate of 2 gal. per *minute* per sq. ft. in the rapid sand filters. Although the sand must be removed from the slow filters and cleaned every three months (as is generally required in the operation of such units), it is claimed the use of slow sand filters is justified because they remove disagreeable tastes resulting from constituents contained in salt water which infiltrates into the supply.

The plant delivers a net output of about 32 mgd., but plans already have been completed to increase the capacity to 53 mgd. by adding six slow and twelve rapid sand filters. Experimental work is now being carried out to determine if the sedimentation system requires enlargement to meet the increased demand.

The purified water from the Lovo Plant is clear and nearly colorless except for a faint blue-green tint. Whereas the color of the water before treatment may be as much as 40 ppm., that of the purified water rarely exceeds 5 ppm. The raw water turbidity of 300 to 500 ppm. is reduced to less than 10 ppm.

Corrosion Control

Corrosion control of the final treated water is accomplished by adding saturated lime water; this is prepared by slaking high quality quick lime. The pH of the raw water (7.0 to 8.0) is reduced after coagulation to a range of 6.3 to 6.7.

Final adjustment for corrosion control produces a treated water with a pH of 8.5. The amount of lime presently used is about 10 ppm. A pH meter is used to monitor the pH of the water at various stages of treatment. Control of pH is important because of the need for color removal. The final step in the treatment is disinfection, in which chlorine is applied at the rate of 0.25 to 0.3 ppm. The water leaving the plant contains a chlorine residual of 0.15 ppm.

Taste and Odor Improvement

In spite of the precautions taken there exists a lake "odor" which, although a typical condition for all surface waters, appears to be rather distinct in Lake Malaren water. This is especially noticeable in the latter part of the summer. Improvement in the taste has resulted from adding from 2.5 to 30 ppm. of activated carbon to the water. Much experimental work has been carried out to determine the causes of the taste and odor of the water. It has been concluded that much of the odor is due to plankton but is rarely ascribable to any particular type. Lengthening of the intake pipes and increasing the depth of intake (from 33 to 75 feet) has been helpful in improving the taste of the water during summer months.

Slow sand filters have been found most beneficial in improving the odor and taste of the finished water. This improvement is not, as might be expected, due to the surface coating "schmutzdecke." It is ascribed instead to bacterial activity which may influence biochemical oxidation of organic compounds. Interestingly, results appear to be improved if nitrogen and phosphorous are added to the water before filtration, a procedure that has been studied in this country. Regardless of the factors responsible, the slow sand filters produce an improved water as soon as they have ripened. However, if the water is over-chlorinated, the filters fail to improve its odor or taste.

Other factors that influence the effectiveness of slow sand filter operation are the rate of filtration and the thickness of the sand bed. Under conditions prevailing at the Lovo plant, satisfactory purification is obtained at a filtration rate of about 7.5 gal. per hr. per sq. ft., with an average sand bed thickness of 40-inches.

Post aeration following the slow sand filters is helpful for reducing odors. In the present design, the water is aerated with fresh filtered air while cascading down over the step aerator. This permits some of the carbon dioxide generated during the coagulation to be removed, thus minimizing the amount of lime needed for corrosion control.

Water Requirements Increase

It is apparent that the Swedish people, taking full advantage of the

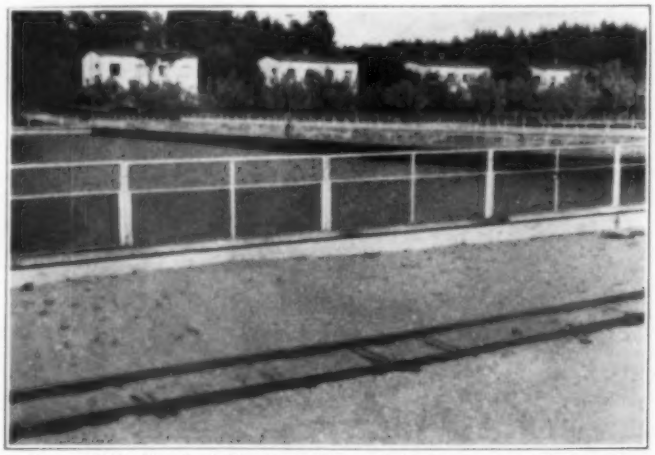


Fig. 6—OPEN Slow Sand Filter Plant—Homes of Plant Employees in Background

Table I

ANALYSES OF TREATED WATER SUPPLY STOCKHOLM, SWEDEN

Constituents	As	Parts Per Million
Calcium	Ca	30.0
Magnesium	Mg	5.0
Chloride	Cl	15.0
Sulfate*	SO_4	60.0
Bicarbonate	HCO_3	60.0
As Calcium Carbonate:		
Calcium Hardness		75.0
Magnesium Hardness		20.5
Total Hardness		95.5
M Alkalinity		49.0
Oxygen Consumed (Permanganate)		10.0
Conductivity mm. at 20°		250.0
Evaporated Residue		190.0
Volatile Residue		30.0
Ignited Residue		160.0
pH		8.5
Turbidity Pt.		10.0

*High value due to alum addition.
Raw water—pH 7.2.

natural resources made available by nature at their doorstep, have made long-term plans to assure a supply of all the water needed for a long time to come. The plans have required much diligent work and resourceful engineering.

The daily per capita water consumption in Stockholm from 1915 to 1950 was illustrated in an earlier article (Water & Sewage Works, March, 1952, p. 90). It is apparent that the consumption has been increasing steadily throughout the period. This has been due partly to the growing population and partly to the increasing number of houses equipped with bathrooms and hot water installations. According to recent estimates, nearly 70 per cent of the homes in Stockholm have been modernized with regard to provision for water services.

In 1948 the capacity of the Norsborg Plant was increased to 50 mil. gal. per day, bringing the system capacity up to 82 mil. gal. per day. The upward trend in water consumption reveals that a further increase in capacity will be necessary in the immediate future. Further, some of the neighboring communities have a difficult water supply problem and provision will have to be made for these to obtain water from the Stockholm plants.

It is interesting to note that, unlike Norway, meters are installed in every house. The water is charged for at rates approved in 1937 and still unchanged. The basic rate is 17.5 cents per 1000 U.S. gal. with discounts for large consumers. In 1947 the average cost for water was 13 cents per 1000 gal., and the production cost 9 cents per 1000 gal.

There are five large industrial plants in Stockholm which have their own water for processing use. Some of the water is withdrawn from underground because of the low temperature of the water. Although there still are many wells in use, most are very small, the sands in Sweden not being good water producers. Much of the well water in Sweden contains iron. This is especially true of south Sweden. Further, the water generally is hard, whereas water from Lake Malaren only contains 28 ppm. of hardness (but this is increased to 70 ppm. by treatment). A typical analysis of the treated water is shown in Table I.

Acknowledgement

The author wishes to express his appreciation to Mr. Einer Nordenstahl of the City Water Department of Stockholm, Sweden, who so kindly arranged the inspection of the Lovo Plant.

[Previous articles in this series by Mr. Knoedler dealt with the water supply of Oslo, Norway, in March and Copenhagan, Denmark, in May. The next article will be devoted to the water supply of Helsinki, Finland.—Ed.]

Court Rules Realistically on Award to Non-low Bidders

In Which Quality Outrates Price Comparison.

The outcome of a suit brought to force a Florida municipality to award a contract for a certain mechanized device to the "lowest responsible bidder," as called for in purchasing by public bodies, has particular interest to water and sewage works managers.

What the Florida Supreme Court had to say in ruling on the case is substantially the following. In upholding the award of contract to a bidder other than the "lowest responsible bidder" the Court stated that discretion may be used in bid-purchasing. The Court went on to state that "the mechanical operation of such a machine, the facility with which it manipulates, the material of which it is constructed, its wearing quality, and other factors that tend to render it serviceable and accurate, longer lasting, or more fool-proof" may properly be taken into consideration as a basis for contract awards in purchasing through competitive bidding.

This modern decision of a State Supreme Court is a healthful one for the municipal field, where the long custom of purchasing on price alone has resulted in a higher long term cost for low first cost equipment. It lends emphasis to the importance cost-wise of purchasing quality equipment for the sake of long-lived dependability in public utility operation.

(Cartoon by Chas. Rodrigues in The American Magazine.)

"Would you mind telling me Mabel: Just how many glasses of water do you drink a day."

Too Much Fluoride in Japan's Water Supplies

Japan is one country where they do not need to add fluorides to the water supplies to suppress tooth decay.

The Welfare Ministry reports that Japanese in 42 of 46 prefectures are drinking water containing too much fluoride, with the result that many have mottled teeth. The source of the high content of fluorides in the natural waters is believed to be due to the fact that Japan has had a long history of volcanic action.

Example of Government Paternalism

Anyone thinking that they will ever end up happy or prosperous by expecting the government take care of them in years to come had better stop and consider what happened to the American Indian!

Report of Texas Short School*

Old and New Features draw 604 to Texas A. & M. College—
Water and Sewage Awards Presented.

AN attendance of six hundred and four again set an all-time high record of registration at the Thirty-Fourth Annual Short School of the Texas Water and Sewage Works Association held at Texas A. & M. College, College Station, Texas, March 9-13, 1952. The Short School is held in cooperation with the State Department of Health, Southwest Section of the American Water Works Association, State Board for Vocational Education, and Texas A. & M. College. Our Association was proud to announce this year an active affiliated membership of over 2,000.

Best Regional Attendance Award

D. B. Dickson (left), Awards Comm. Chmn., presents award to T. O. Pilant, President of White Rock Water and Sewage Works Assn.

Certified Sewage Operators Award

Stuart Williams (left), Secretary, Hill Country Water and Sewage Works Assn., receives "highest percentage" award from Mr. Dickson.

The first general section was presided over by Mr. E. J. M. Berg of Austin, President of the Texas Water and Sewage Works Association. Mr. V. M. Ehlers, State Sanitary Engineer of Texas, and founder of this Short School, reviewed recent innovations in the water and sewerage fields. Mr. Ehlers made reference to the severe drouth which Texas has suffered for the past few years and stated that since rainfall conditions and records followed a certain cycle pattern, it was essential to plan for the future. He further stated that the drouth was not only a serious problem to water and sewage works, but to all industries in the State and especially to agriculture. Mr. Ehlers expressed hope in securing assistance and relief from this problem from the newly created Legislative Council in Texas.

The program of the school followed the same pattern as in past years; that is, of holding separate sectional meetings in water and sewage and dividing each of these into three respective grades A, B and C. All subjects presented in these sectional meetings were in panel discussion form with a moderator and assistants as well as a secretary for recording of proceedings. Each of these meetings was so well attended that there was scarcely "standing room" and often last minute arrangements had to be made for a larger meeting room to accommodate the crowd. There was excellent audience participation and the program in each section was of such interest that it was difficult for the members to make selections.

Water Operators Award

C. C. Roark (left), President, Trinity-Neches-Sabine Assn., receives "highest percentage award from M. B. Cunningham, V. P. Elect, AWWA.

The annual joint meeting of Regional Water and Sewage Works Associations was held with President Berg presiding. Mr. Clyde R. Harvill, formerly of Texas and a member of our Association, now with the Water Resources Division of the N.P.A., Washington, substituted for Gerald E. Arnold, Director, and explained procedure in "Obtaining Federal Assistance in Procurement of Water and Sewage Works Materials and Supplies." Another outstanding speaker was Mr. Earnest Boyce, President of the FS & IWA. Mr. Boyce presented a discussion of "New Frontiers of Sanitation" and gave an additional "treat" in the form of a travelogue with colored slides describing his trip to Germany during the summer of 1951 with a special group of public health authorities from the United States. Another feature of this meeting was the presentation of Texas Stetson hats by President Berg, as an expression of gratitude from our Association, to Mr. Earnest Boyce and Mr. Kerwin L. Mick, Chief Engr., and Supt. Minneapolis-St. Paul Sanitary District, both of whom made valuable contributions to the program. Mr. Mick participated in the Grade A Sewerage Section on Monday afternoon on the subject of "Paints and Protective Coatings for Sewage Works".

Industrial Waste Symposium

One sewerage session was in the nature of an "Industrial Wastes Symposium". This is the third year such a symposium has been conducted in connection with the Short School. This year there were approximately

* Condensed from a report prepared by Mrs. Earl H. Goodwin, Asst. Sec'y-Treas., Texas Water & Sewage Works Assn.

100 in attendance. Subjects relating to industrial wastes were discussed by authorities who are associated with some of the largest industries in the State. It was gratifying to the Association to learn that this important group of members is requesting that a two-day session be arranged in future programs for the discussion of their problems.

A new feature of our program was the business luncheon of the Texas Section of the FS & IWA; Dr. C. H. Connell, Chairman of the Section, presided. The Committee on Awards nominated Mr. W. S. Mahlie of Fort Worth to receive the Arthur S. Bedell Award of the Federation in recognition of extraordinary and meritorious service to member associations of the Federation. The Nominating Committee presented the following slate of officers for 1952:

Chairman—A. H. Ullrich, Austin
Vice Chairman—A. C. Bryan, Houston
Secretary—V. M. Ehlers, Austin
Assistant Secy.-Treas.—Mrs. Earl H. Goodwin, Austin.

The report of the Nominating Committee was unanimously accepted and the officers elected by acclamation.

The Program Committee arranged again this year for a special "Bottled Water Session" which is the third year for this feature of the program. There was an attendance of over 50 in this session which represents a large percentage of the men engaged in the bottled water industry in Texas. The interest of the bottled water industry in our Short School as a means for furthering educational facilities in their industry is most gratifying to our Association and we predict a further expansion of this program both in activity and interest.

Business Meeting

The annual business meeting of the Texas Water and Sewage Works Association was held. Mr. Ehlers outlined the progress of the operators' certification program in Texas. The Secretary reported that during 1951, 34 regional associations affiliated themselves with our Association by payment of dues for a total of 1,760 members. Two of these associations were organized during the year and total membership showed an increase of from 1,557 in 1950 to 1,760 in 1951. The Nominating Committee proposed the following slate of officers for the ensuing year:

President—Alfred Neffendorf, Fredericksburg
Vice-Presidents—John E. Williams, San Angelo; J. R. Bryan, McKinney; R. H. Tate, Post; and N. W. Black, Greens Bayou.

The report of the Nominating Committee was accepted and all officers elected by acclamation.

The regular luncheon of the American Water Works Association was held with a capacity attendance. Mr. Henry Wilkens, Houston, Chairman of the Southwest Section of the AWWA presided at this meeting. Mr. Wilkens introduced Mr. Morrison B. Cunningham, Superintendent of the Water Department of Oklahoma City, and also Vice President Elect of the AWWA. Mr. Cunningham has the distinction of being the first member of the Southwest Section to be elected to the Board of Officers of the AWWA. Mr. Cunningham briefly reviewed the various programs being carried on by the AWWA and pointed out the advantages to be secured from membership in that organization.

Banquet Session

The last regular session of the Short School was held in the form of a banquet session. This session is always attended by a capacity crowd and is one of the special highlights of the meeting. As in past years, Dr. George W. Cox, State Health Officer, gave "A Review of Accomplishments in 1951". Dr. Cox pointed out that Texas can well be proud of its accomplishments and progress in the water works and sewage fields during the past year with particular emphasis on the vast amount of new construction and improvements to the plants. The annual Honor Roll was announced by Dr. Cox as follows:

1. For Water Works:

(a) Highest percentage of population connected to the public water supply system — Jefferson County Water Control & Improvement District At Groves.

(b) Best water plant laboratory for control—City of Marshall.

2. For Sewerage Systems—

(a) Highest percentage of population connected to the sanitary sewer system—Fredericksburg.

(b) Largest ratio of sewer connections completed during the past year—Del Rio.

(c) Making the most advantageous use of its sewage plant effluent for irrigation purposes—Burnet.

(d) Making the most advantageous use of sewage sludge—San Angelo.

(e) Maintaining the best sewage plant laboratory for control—San Antonio.

For the remainder of the Honor Roll suitable awards in the form of loving cups and plaques are presented to Texas cities for the following achievements:

BANQUET SESSION—34th Annual Short School, Texas Water & Sewage Assn.

1. City with water plant presenting the most attractive appearance—Crockett County Water Control and Improvement District No. One at Ozona.

2. City completing the greatest improvements to its water supply system—Baird.

3. City maintaining the most attractive sewage treatment plant—Bandera County Water Control & Improvement District No. One.

4. City having the sewage treatment plant which produced the effluent of best quality during 1951—Mason.

5. City completing the greatest improvements to its sewage treatment plant during 1951—Longview.

In addition to the Honor Roll Awards presented by Dr. Cox, each year additional awards are presented upon recommendation of the Committee on Awards of the Association. Mr. D. B. Dickson, member of the Committee, presented the following awards this year:

1. Honorary Life Membership Awards—to Messrs. Uel Stephens of Fort Worth and E. J. Umbenhauer of El Paso.

2. The Committee learned that one of the members of the Association spent fifty continuous years in the water and sewage profession. It was the feeling of the Committee that special recognition should be given to this outstanding record and therefore, a certificate was presented to Mr. W. N. Joiner of San Marcos.

3. Regional Association Attendance Award—This award is presented annually by the Association and the winning score is computed on a formula of number of men present times square root of miles travelled times percentage of membership present. For the second consecutive year this award was won by the White Rock Water and Sewage Association with a score of 13,300. Sam Houston Water and Sewage Association was a close "runner-up" for the award with a score of 12,200, and received honorable mention.

4. The plaque presented each year to the Regional Association with the highest percentage of certified sewage plant operators was won this year by the Hill Country Water and Sewage Works Association with 44 per cent, and honorable mention to the Pecan Valley Water and Sanitation Association with 24 per cent.

Mr. Morrison B. Cunningham, Vice President Elect of the AWWA presented the last two awards.

1. The Southwest Water Works Journal Award to the Regional Association with the highest percentage of certified water works operators—The award this year was computed on the highest proportion of the regional association's total membership which are certified water works operators and was presented to the Trinity-Neches-Sabine Water and Sewage Works Association with a score of 69.1 per cent. Honorable mention was given to the Pecan Valley Water and Sanitation Association with a score of 68 per cent.

2. Southwest Section of the American Water Works Association Award to the regional association with the highest percentage of approved public water supplies was presented to the Guadalupe Valley Water and Sewage Works Association with a score of 53.4 per cent and honorable mention was given to the Citrus Water and Sewage Works Association with a score of 41.7 per cent.

Thus the Texas Water and Sewage Works Association concluded its 34th successful year of activity, and it is the hope of all of the leaders of the Association that the year 1952 will prove another banner year for the organization.

Water Works Operators Manual From Texas Short School

The "Manual for Water Works Operators" is a one-volume library of practical information covering the fields of water treatment and distribution. In addition, discussions of many related subjects are included in this third edition of the Manual.

A cloth bound book of 573 pages, the Manual was prepared by a committee and by L. C. Billings as Editor-in-Chief. The important contribution made by Mr. Billings was recognized in the citation with which the Southwest Section of the A.W.W.A. selected him to receive its 1952 George Warren Fuller Award.

The twenty-one fact-filled chapters were prepared, reviewed, and revised by 30 authors. First discussed are the characteristics and sanitation of surface and ground water supplies, and the pumping, measuring, and metering of water. The treatment plant and its operation are covered in two chapters and individual chapters are devoted to physical and chemical testing, bacteriological testing, disinfection, algae control, softening, distribution and storage. Other chapters cover special features of industrial water supplies, financing, and rate structures. Each chapter concludes with a short list of review questions to check the reader's knowledge of information presented.

The manual includes an appendix of ten shorter chapters presenting useful information relating to subjects such as standards, emergency operations, safety measures, pollution regulations, and fluoridation. The discussion of only a few items—requirements of the State Departments, Certification of Plant Operators, etc.—is restricted to the State of Texas. A comprehensive index completes the volume.

Every waterworks man can benefit by reading and referring to the Manual. He will find clear and authoritative information, prepared with the needs of plant operators in mind. This book is distributed through the cooperation of the Texas State Department of Health and the Texas Water and Sanitation Research Foundation, Austin, Texas.

Rolf Eliassen to Represent U.S. at W.H.O. Geneva Assembly

Dr. Rolf Eliassen, Professor of Sanitary Engineering, Mass. Inst. of Technology, has been designated by the Department of State as the engineer member of the U. S. Delegation to the Fifth World Health Assembly. The Assembly will be held at the League of Nations Building in Geneva, Switzerland, in May. Delegations from more than 60 nations will be in attendance, having joined together in the World Health Organization whose function is to act as the directing and coordinating authority on international health work.

Dr. Eliassen has been granted a leave of absence from his position as Professor of San. Eng. and Director of the Sedgwick Laboratories at the Massachusetts Institute of Technology, in order that he might attend the Assembly.

Ed. Note: This information reached us too late for use in our May issue. By the time it is read in our June issue Dr. Eliassen will have gone to Geneva and returned.

Do You Have One of Those "Blooming Things"?

Stranger in Town: What do you have here that's outstanding?

The Mayor: Have you seen our new Activated Plant yet?

Stranger's Wife: Oh no—and, is it in bloom right now?

Industrial Waste Treatment Plants

Some Engineering Design Features

by JOHN J. BAFFA, *Consulting Engineer, New York, N. Y.*

SANITARY engineering design details are of primary interest to the design engineer. The detailed design phase of any pollution abatement project is replete with problems of engineering interest. This discussion is devoted to some of the engineering features encountered in industrial waste pollution abatement from the standpoint of the designing engineer.

Solving Industrial Waste Problems

The broad problem of abating watercourse pollution due to industrial waste discharges is a complex one. Very often the solution to a waste disposal problem is found within the manufacturing process procedures. If such is the case the waste disposal program can become a "waste elimination program" in the literal sense, with actual profits sometimes accruing to the industry. On the other hand, some wastes have to be treated before discharge. The basic solution of the treatment problem, involving choice of treatment process, lies in the fields of inorganic and organic chemistry, biochemistry and biology and some of their specialized subdivisions. The activities of specialists in these fields, can be coordinated by the sanitary engineer who can weigh laboratory and pilot plant results in balance with effluent requirements, stream flows and waste flows.

To consummate the solution to a treatment problem, it is necessary to develop the detailed design and prepare plans and specifications for construction. In this consummation procedure of detailed design, the designing sanitary engineer can bring to bear the knowledge gleaned during the many decades that domestic sewage treatment plants have been designed and operated. In fact, a large percentage of industrial waste treatment plants designed and built in present day practice, to treat organic wastes, utilize the time honored processes of domestic sewage treatment. In the inorganic waste field the processes and principles in use these many years for the treatment of water can usually be employed. While the detailed design of industrial waste treatment plants may require certain special considerations, the basic principles remain the same as for the treatment processes of municipal sewage or water supply. The effects of topographical conditions on choice of plant location, plant layout and construction cost are common to all treatment plants. Thus the detailed design of an industrial waste treatment plant requires an integration of process requirements, hydraulic and structural considerations and, most importantly, a knowledge of treatment plant operation and functioning.

Municipal vs. Industrial Treatment Plants

In the design of industrial waste treatment plants, the designer's ingenuity is very often taxed to the utmost to provide a maximum of economy and the provision of flexibility in the face of unknown quantities. This is due in large measure to the non-enduring character of industrial processes and concomitant economic requirements, which are reflected in a standing rule in many industrial organizations that all projects should show a 25% return from the improvement in three years. When this requirement is compared with municipal financing, with 20 year bonds at 2% interest, it becomes evident that capital expenditure for industrial waste treatment assumes great importance. The net result in many instances is the stated objective of limiting a project strictly to present needs and yet taking due cognizance of the fact that expansion may become necessary at an un-predeterminable time.

Unfortunate for the peace of mind of the designing engineer, is the fact that the laws of hydraulics are not compatible with the requirements of industry. Domestic sewage flows follow familiar patterns and a pipe size can be designed for a 20 year period for a municipal plant and still maintain a high enough velocity to prevent sludge accumulation compatible with reasonable head loss for future flows. Unfortunately this is not the case in most industrial installations. Peak industrial flows may vary from 300 to 500 percent or more of average; if, to this fact is added the possibility of future expansion, the situation becomes difficult. It becomes

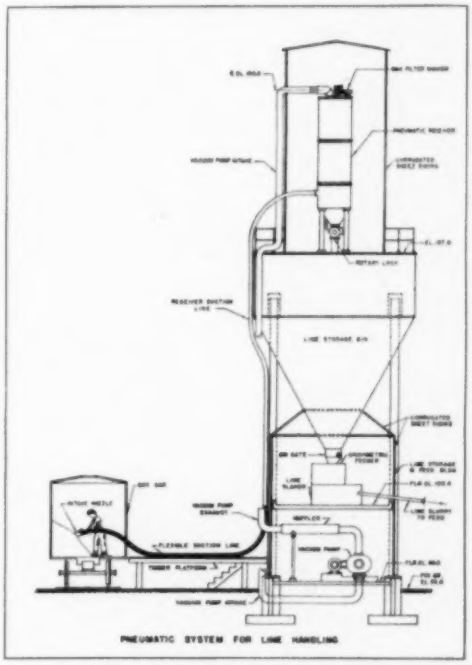


Fig. 1—Pneumatic system for lime handling.

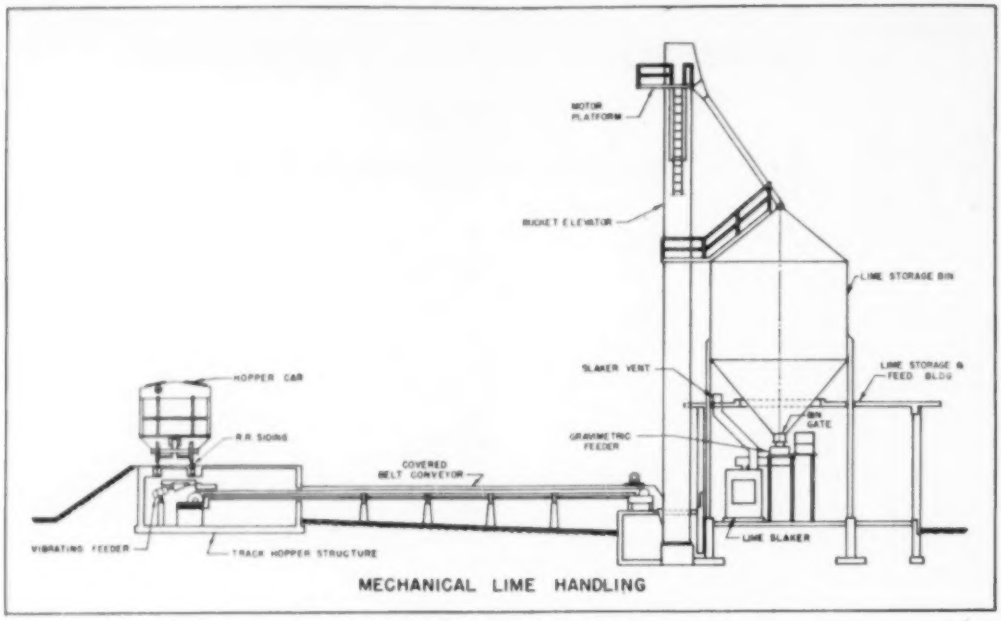


Fig. 2—Mechanical system for lime handling.

necessary to choose a pipe size for conditions in the immediate future, and for the more remote future. Consequently the designer has to anticipate the need for an additional pipe line at some future time even though this procedure is uneconomical when judged by municipal standards.

Many municipal treatment plants are objects of civic pride and thus plant buildings may require facades pleasing to the eye and construction for permanence, with a minimum of maintenance and provision for interior comfort. On the other hand, for industrial purposes, the plant buildings in many instances may comprise simple wooden or corrugated steel structures to perform a minimum function of keeping equipment out of the weather. Sanitary conveniences, offices and laboratories are often already present in manufacturing buildings and need not be provided at the industrial waste treatment plant.

An Example of Economy in Space Utilization

An example of economy in operating building construction and space utilization is illustrated in Figure 1 which shows a pneumatic unloading system for unloading quicklime from box cars. The space under the bin is enclosed with corrugated siding and provides a two story operating building. The ground level floor houses the vacuum pump for the pneumatic unloading system and switch gear. The second story houses the slaking equipment and gravimetric feeder. The elevation of the slaking equipment thus obtained permitted gravity flow of lime slurry to the point of feed. The building is heated by steam from manufacturing plant mains. One of the structural problems involved in this design was that of providing adequate wind bracing for this tall structure and still finding sufficient room for windows and doors for light and ventilation and means for moving equipment in and out of the building. The pneumatic equipment shown is that of the Dracco Corporation.

An alternative design to that shown in Figure 1, is shown in Figure 2 where pebble lime is delivered by hopper cars and handled entirely by mechanical means. The material is conveyed by belt conveyor to a bucket elevator which lifts it to the lime storage bin. In this instance the slaker is at ground level and lime slurry is pumped to feed and the rate of feed is regulated by automatic pH control. One of the problems involved in this design was the consideration of separating the storage bin foundations from the building foundations to secure economy and at the same time limit the effects of differential settlement due to different loading conditions.

Special Design Considerations

A feature common to most industrial waste treatment plants which is rare in municipal plants is the need for a compositing or equalization basin to absorb marked flow variations and provide quality buffering. Since the required volume of such basin may be rather large if it is to store an accumulation of waste for an entire day the earthen lagoon finds wide application for this purpose.

Concrete tanks find almost universal application in municipal treatment plants, while for many applications in industrial treatment plants it is more economical to resort to the use of lagoons or to wooden or steel tanks. Capital cost economy may be dictated by the material to be handled, foundation conditions, structural requirements or site topography. In the practical applications of such containers, as is axiomatic in domestic sewage treatment, the inlet and outlet devices require careful consideration to accomplish the important functions of flow distribution and maintenance of optimum velocities to prevent breaking up of floc or to prevent deposition of solids.

An example of the solution to a problem requiring consideration of inlets and outlets to secure adequate dispersion and prevent short circuiting is shown in Figure 3. This problem was solved in an earthen lagoon by construction of "perforated distribution embankments" across the 300 foot width of the lagoon at its inlet and outlet ends to secure distribution of flow. This device was considerably more economical than the construction of weirs, timber baffles or perforated concrete walls; particularly since the lagoon was to store acid wastes. Since the lagoon was in "cut" it was only necessary to trench and lay the pipes through the embankment. This particular compositing lagoon was also paved with asphalt to limit the exfiltration of wastes and protect the ground water reservoir against possible contamination.

After equalization, if treatment process requires constant rates, a positive form of rate control under fluctuating upstream water level is required. The water works rapid-sand-filter rate controller finds wide application for this purpose but requires special internal construction when acid wastes are handled.

Where wastes are treated anaerobically, as may be the case for strawboard or yeast wastes, the hydraulic design and choice of digester equipment are predicated upon passing the entire waste flow continuously through the digestion tanks. Gas seals must be maintained even though digesters may have top outlets and fluctuating waste levels.

Life Expectancy vs Initial Cost of Materials and Equipment

Acid wastes and strong alkali wastes require special materials of construction to limit corrosion of tanks, piping and equipment. Acid resistant and alkali resistant tank linings and piping materials require careful study for economical choices which should at the same time take due account of structural and hydraulic considerations. The choice of acid resistant pumping and process equipment must be based on useful life versus cost. The handling of bulk materials such as quicklime requires special attention to storage bin slopes to prevent "arching" and the exclusion of moisture.

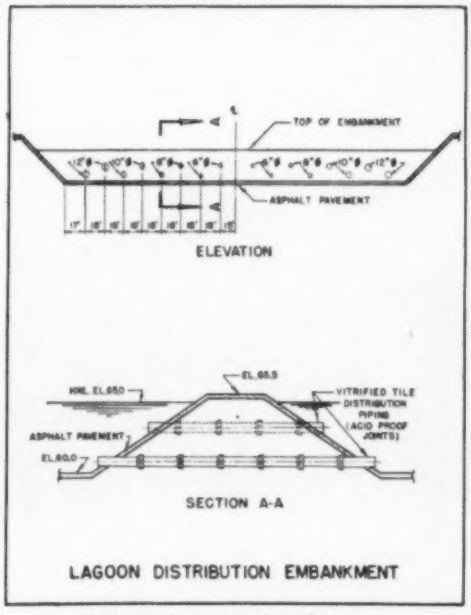


Fig. 3—Distribution embankment for lagoons.

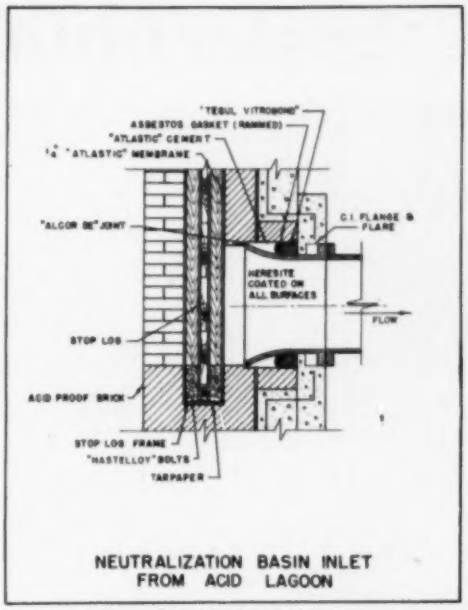


Fig. 4—Basin inlet from acid lagoon.

An example of the use of acid resistant materials is illustrated in Figure 4 which shows a method devised for making an outlet connection from an acid waste storage lagoon to a rate controller chamber for waste delivery at constant rate from the lagoon under a fluctuating upstream head. The exterior of the concrete rate controller pit is lined with acid proof brick. A bell-mouth is provided for minimizing head loss due to entrance. Of particular interest is the joint between the concrete and the flare piece. Requirements of the design were to prevent acid from coming in contact with the concrete and make the joint tight against upstream pressure. Structural strength against pressure was supplied by the concrete backing inside the pit. The jointing materials shown are those of the Atlas Mineral Products Co. The cast iron pipe through the wall was specified to be lined and coated with "Heresite." The downstream rate controller was specified to have internal cast iron surfaces lined with "Lithecoat" and internal working parts were specified to be of Hastelloy B.

Conclusion

The integrations of treatment process requirements with the structural and hydraulic fundamentals of detailed design to attain economical utility for industrial wastes treatment plants provide a fertile field of expression for the designing sanitary engineer. There is much truth in an old adage often heard where engineers gather—"Engineering problems and construction economy are resolved on the drawing board."

[Drawings for the illustrations were prepared by Richard Pierce Jr., assistant engineer in the writer's office.—J.J.B.]

This is the Lot . . .

FIG. 1—1940

The half-acre lot on which only cedars grew.

FIG. 2—1945

After five years this was the front border.

In Which the Author Illustrates Photographically The Beneficial Effects of Sludge on His Own Land During a Decade of Development

by LEROY W. VAN KLEECK, *Principal Sanitary Engineer, State Dept. of Health, Hartford, Conn.*

If "seeing is believing" this article should add support to the many authors who have pointed out the soil improvement afforded by the application of digested primary sludges.

The author has presented his opinions in a number of articles listed herewith. This presentation supplies confirmatory evidence by illustrating the effects of sludge on his own New England plot of ground during a period of ten years.

The original topsoil was of poor quality (see following report) with a subsoil of coarse gravel. This is the lot that sludge nourished—the photographs and titles tell the story.

SOIL TEST ON AUTHOR'S LAND, JUNE 10, 1940
CONN. AGRICULTURAL EXPERIMENT STATION

Texture: Loam	Calcium: Low
pH: 5.1	Magnesium: Medium
Nitrate nitrogen: Very low	Aluminum: High
Ammonia nitrogen: Very low	Manganese: Trace
Phosphorus: Very low	Humus content: Very low
Potassium: Very low	

1. "The Use of Sludge as Fertilizer." Conn. Health Bull., Feb. 1940.
2. "The Use of Sewage Sludge as Fertilizer and Soil Conditioner." Public Works, June 1940.
3. "The Use of Sewage Sludge as Fertilizer." Proc. Am. Soc. Civil Engrs., Jan. 1943.
4. "The Use of Digested Sewage Sludge for Fertilizer in War Emergency." Conn. Health Bull., Feb. 1943.
5. "Sludge as Fertilizer in the War Emergency." Water & Sewage Works, May 1943.

FIG. 3—1940

Stony character of soil where septic tank and tile field are placed. The finished ground and planting in this area is illustrated in Fig. 5.

FIG. 4—1943

Chinese elm planted with two wheelbarrows of sludge—fed yearly with Milorganite. Growth of the tree shown in Fig. 5.

FIG. 5—1948

Eight years of growth in the back yard. Note growth of Chinese elm and cedars in five years—this area is that shown in Fig. 4.

That Sludge Nourished

FIG. 6—1951. FRONT FOUNDATION PLANTINGS
Over 150 trees and shrubs of all types thrive on sludge.

FIG. 7—1945
Front border showing above fence. View from street toward house.

FIG. 8—1951
Front border six years later. View from house toward street.

FIG. 9—1940

View of the back yard showing stony character of the soil. Digested sludge was ploughed into topsoil before seeding the lawn.

FIG. 10—1942

The back yard two years later. Subsequent feedings have been largely Milorganite or digested sludge with and without superphosphate.

FIG. 11—1942

Small hemlocks are started along the west front border. All plantings have been top dressed with digested sludge in subsequent years.

FIG. 12—1951

Dwarf apple tree orchard. Several shovels of digested sludge were mixed with the soil in every planting hole for every tree and shrub.

FIG. 13—1944

West back border after two years of growth.

FIG. 14—1949

Five years later the west back border closes in.

FIG. 15—1948
VEGETABLE AND FRUIT GARDEN

On this plot, 40 ft. by 100 ft., two to three tons of digested sludge were ploughed into the soil each spring for the first six years. Subsequent applications have been made every second year. Light additions of a commercial fertilizer or potash were made during the growing season to provide a balanced soil. Soil was heavily limed and potash was added the first year. A soil pH of 6.0 to 7.0 is maintained by subsequent additions of lime every three years.

FIG. 16—1951
VEGETABLE GARDEN

In this garden is grown all family needs of the following crops: string beans, lima beans, beets, broccoli, cauliflower, celery, corn, cucumber, eggplant, muskmelons, onions, peas, peppers, white potatoes, radish, spinach, squash, tomatoes, asparagus, raspberries, rhubarb, strawberries, grapes, and annual flowers. Substitute crops in some years include sweet potatoes, watermelons, brussel sprouts, and parsnips. All show excellent response to sludge applications. Sludge is also used on the lot to grow blueberries and plum, apple, and cherry trees.

FIG. 17—1951
PERENNIAL FLOWER BED

This is Mrs. Van Kleeck's flower bed backed by a privet hedge. Flowers, too, show the benefits of sludge application.

And so concludes the story

of the first ten years

in developing

"The Lot that Sludge Nourished"

WATER & SEWAGE WORKS

Report from Abroad

New Developments in Sewage Treatment in Great Britain—The Porteous Process

by JOHN FINCH, *Manager, Sewage Disposal Dept., Rotherham, England*

There have recently been held in Britain at least three meetings at which both sewage treatment plant designers and operators have been present, and each faction has had the opportunity—not often experienced—of constructively criticizing the work of the other. As a result the meetings have been informative, enjoyable and thought-provoking functions; so much so, in fact, that at one meeting after the chairman had metaphorically fired the starting pistol, the combatants became so engrossed and involved, each in their own problems, that the person responsible for presenting the principal technical contribution actually took little further part in the proceedings, until after a hectic two hours he was suddenly remembered by the chairman and asked to reply to the discussion—or so it appeared.

At one of these meetings, the paper was presented by John Thornton Calvert, a member of a firm of consulting engineers in Britain, and incidentally, at one time a participant in a two-year course of study in Boston, Mass., where he took a Master of Science degree at M.I.T. It is rather interesting to note that Mr. Calvert is the son of the late Dr. H. T. Calvert, one time Chief Chemical Inspector of the old Ministry of Health, and so has the right background for sewage treatment problems.

Of the many points that were raised for discussion during the course of this meeting, possibly the one that created the greatest interest was that dealing with the construction and design of the Crawley New Town Development Corporation sewage treatment plant. The Crawley Development Corporation was established under the New Towns Act of 1946 with the object of creating a town of 50,000-60,000 people and the sewage treatment plant has been laid out with this object in view.

The establishment of new towns in the London area has created particular problems owing to the fact that there is lacking the over-abundant supply of water of western towns; for the same reason the rivers on which the new towns are located are relatively small and unsuitable for the reception of large volumes of industrial effluents. The Crawley Development Corporation has therefore exercised control over industries admitted to the town to ensure that the demand for water does not exceed the supply and that the effluents discharged from industries are not harmful either to the treatment of the sewage or the purity of the watercourses.

Crawley has been drained on the separate system and the sewage works has been designed to treat both domestic sewage and industrial effluents. The peak flow conditions will be such that the sewage treatment plant will have capacity to deal with four times 45 gallons per head of population of domestic sewage, and twice 20 gallons per head per day of industrial effluent. The primary settling tanks are designed to give a retention period of six hours, the aeration tank (diffused air) twelve hours, and the final clarifiers six hours, all based on the normal dry weather flow.

Points of interest about the sewage plant are that the aeration tanks are five in number, two being five feet wide, two ten feet wide and the fifth fifteen feet wide so as to give the maximum degree of flexibility particularly for reaeration. Further, the final clarifiers are circular flat bottom tanks with syphon sludge draw-off from the floor of the tank.

In respect of the effluents produced by the Crawley sewage treatment plant, the Thames Conservancy Board—the concerned river authority—demanded an effluent of superior quality to the general standard of the Royal Commission, and suggested that the B.O.D. should not exceed 10 ppm. and the suspended solids not exceed 20 ppm. Whilst the necessity for a high quality effluent was admitted, it was decided after consultation with the Ministry of Health that the works should be constructed with an excess aeration capacity and experience should decide any subsequent necessary treatment to protect the stream into which the effluent flows.

The Royal Commission standard for effluents being 20 ppm. for B.O.D., and 30 ppm. for suspended solids, it will readily be appreciated that the standard required by the Thames Conservancy Board is of a very high order. The performance of this little plant will therefore be observed with the keenest interest.

New Barrhead Plant and the Porteous Process

The new Barrhead (Scotland) sewage treatment plant, officially opened during 1951, offers a new focus of interest in a part of Great Britain which already has much to offer in the way of up-to-date sewage treatment plant, and up-to-date thought on sewage treatment problems, to those operators and engineers interested in modern design and operation.

If Barrhead may be said to have achieved some prominence in the field of sanitation, the credit should go to the late William Shanks, first Provost of the Burgh, who was largely responsible for the installation of what was at that time (1899) considered a very scientific method of sewage purification. At a time when more primitive and unsatisfactory methods were widely employed, Shanks had the courage to propose the then revolutionary system of the bacterial treatment of sewage by means of septic tanks or contact beds.

On June 15th, 1899, Shanks, then Convenor of the Drainage and Sewerage Committee, officially opened the works. At that time, as the first plant of its kind in Scotland, the installation aroused very great interest over a wide field. In 1911 with a view to the greater efficiency that could be obtained, a further development was carried out, involving the conversion of the contact beds to percolating filters, and the addition of storm water settling tanks. These works were in operation until 1951, when the old methods of treatment gave way to the new.

Interestingly enough, the new sewage treatment plant was opened by Andrew Shanks (the son of William Shanks), who is still carrying on the good work started by his father and, who like his father, is the Convener of the Barrhead Drainage & Sewerage Committee at the present time.

The innovation so far as Scotland is concerned in the new Barrhead plant is the installation of the Porteous system of sludge treatment, adopted by the Council after very careful investigation.

The sewage treatment works are designed to give complete treatment to a dry weather flow of 750,000 gal. per day from a population of about 14,000 persons, provision being made for possible future extensions to treat a dry weather flow of 1,000,000 gal. per day. In times of heavy rain, 6 mgd. are given partial treatment by screens, grit chambers and settling tanks, and of this volume, 2.25 mgd. receives full treatment, the balance flowing to Levern Water.

In a nutshell, the Barrhead plant comprises hand-raked screens, constant velocity grit channels, primary settling tanks of hopper bottom design (giving 12 hours retention at flows of .75 mgd.), percolating filters (having a capacity of 78 gallons per cube yard per day at flows of .75 mgd.), and horizontal flow clarifiers (giving a retention period of 4 hours at similar flows, or 1.33 hours at maximum flow of 2.25 mgd.).

Quite obviously, the most interesting feature of the Barrhead scheme is the Porteous sludge treatment plant, which is new to Scotland, and which still is somewhat of a rarity in England where it has not had the appeal that originally was anticipated.

In the Porteous process of heated sludge treatment, wet sludge is passed through a disintegrator and pumped through a heat-exchanger into a series of high pressure vessels where steam heat is applied. After being sufficiently "cooked," the sludge is passed through the heat exchanger (as the heating medium), giving up heat on the way through to incoming cold sludge, and is then settled in decanting vessels (where approximately two thirds of the volume rapidly settles out as supernatant water). This water is decanted off and the thickened sludge residue is passed to storage tanks from which it is drawn to sludge filter presses.

It is claimed that the process will deal not only with primary sludge but also with the more difficult types of secondary sludge. Some of the advantages claimed for the process are disposal in all weathers (an important point in England in say the Pennine districts), total lack of chemicals, and complete sterilization of the sludge.

Some short time previous to the opening of the Barrhead plant and the operation of the Porteous sludge plant, a most interesting and informative paper was published by C. Lumb, Manager of the Halifax Sewage Department, being as it was a report on the ten-year period of operation of the Halifax Porteous plant, installed in 1940. This was a publication eagerly awaited by many sewage works operators and engineers interested in the method of dealing with sewage sludges, and wondering if the heat treatment of sludge would possibly be the answer to their own particular problem.

The Porteous plant at Halifax was decided upon after numerous methods had been explored for dealing with the humus sludge from the percolating filter installation and the surplus activated sludge from the Sheffield Bio-Aeration plant. It appeared, after investigation by means of an experimental unit, that the Porteous heat treatment process offered the greatest technical and economic possibilities in the problem of dealing with these secondary sludges.

When Mr. Lumb's paper was presented a well attended meeting listened with the keenest interest, in the boardroom of the old West Riding Rivers Board at Wakefield. This institution was for many years of international repute (by virtue of its distinguished list of officers, and the magnificent work they did in river pollution prevention) and has been a venue for many a keenly contested technical contribution.

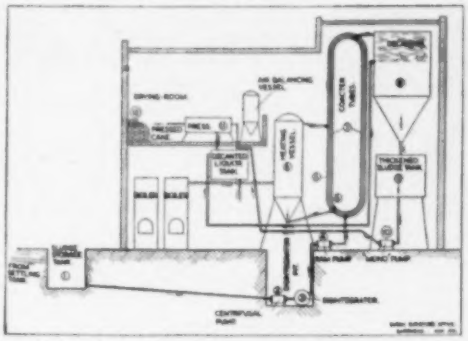


Diagram showing stages of Porteous sludge treatment process at new sewage works of Barrhead (Scotland)

The paper comprised a long-term collection of results of the first large scale Porteous plant to be installed in Great Britain, and referred to the treatment of secondary sludges which, at the Halifax sewage treatment plant, amount to 120-150 ppm. on the basis of sewage flow or around 30 lbs. of dried solids per capita per annum.

Throughout the whole proceedings of the meeting, the emphasis was, of course, necessarily placed upon the heat treatment of secondary sludges, and whilst it may be said that the separate treatment of these sludges, as distinct from primary sludges, is advantageous and worth while on those sewage treatment plants where there are unusual circumstances, such as a very difficult secondary sludge that cannot be linked up with the primary sludge process—a very rare case indeed—such a procedure is not likely to be the case on the smaller type of sewage treatment plants.

One speaker at the meeting asked if the sizeable operation costs of the Porteous process were preventing the development of a fundamentally sound system, and, continuing, went on to compare the operating costs of the Halifax plant of 27.7 pence per wet ton of sludge treated, with the cost of 14.4 pence per wet ton of sludge of similar analysis dewatered on drying beds, at the speakers' particular plant. Whilst it is not always easy to compare operating costs of this description, especially in industrial areas where the inclusion of industrial effluents in the sewer influences vary considerably the character of both the sewage and the sewage sludge settled from the sewage, it appeared to be the feeling of the meeting that the factor of costs was a very pertinent one. In fairness to the Porteous process, it should of course be pointed out that in those rural districts where large areas of land or drying beds are available, the costs of sludge treatment are usually low, but that in built-up areas where space is both valuable and limited, the Porteous process becomes a more practicable but possibly still more expensive proposition.

The *Report from Abroad* will continue to present topics and opinions of timely interest. Mr. Finch is Chairman of the North Eastern Branch of the Institute of Sewage Purification, and is a frequent contributor to British technical journals. He will welcome the opportunity of replying personally to readers of *Water and Sewage Works* who have questions or require additional information regarding the subjects discussed.—The Editors.

The Control of Filter Flies by Chemical Treatment

The Record of a Fifteen Year Battle Between Man and Psychoda

by REINHOLD SPIESS, *Supt., Sewage Treatment Plant, Litchfield, Ill.*

THE sewage treatment plant at Litchfield, Ill., is of the trickling filter, separate sludge digestion type, designed to serve a population of about 7,000. Average design flow is 0.7 mgd. but, due to the use of combined sewers, flows in excess of 1 mgd. often are treated. Raw sewage flows through a grit chamber and is pumped to the primary tanks; there is gravity flow through the subsequent plant units. The plant layout is illustrated in Fig. 1.

The trickling filter, 140 feet in diameter and 6.5 feet deep, is equipped with a power-driven distributor. The filter stone, which ranges from 2.5 to 4 inches in size, is in good condition. At an average dry weather recorded flow of 0.6 mgd., the volume applied to the filter was 1.7 mgad.

Local industries and large water users consist of a creamery processing in excess of 150,000 pounds of milk daily, a plumbing supply manufacturing plant, a shoe factory, a large laundry, and a hospital.

A Fifteen-Year Problem

The sewage treatment plant was placed in operation during September, 1936, and the following spring, species of *Psychoda* (better known as filter flies) established permanent headquarters. Those "little critters," as Dr. W. N. Bruce, entomologist for the State Natural History Survey calls them, made themselves most unwelcome and stubborn filter bed inhabitants. At first one is inclined to be tolerant, hoping that nature will take care of things and that the situation is temporary. But, at the same time, one is glad to see the summer season pass, and to welcome winter because it brings relief.

The spring of 1937 found the flies still present—only worse—and then it became evident that this was a permanent problem, and that ways and means must be found for relief. In the case of the author this was important, as his residence is furnished by the city and is located only slightly over 300 feet distant from the filter. This is convenient as far as work is concerned, but the flies made living conditions most unpleasant and many times the author felt like abandoning his home and the plant.

Living conditions no doubt had most to do with an aroused determination to lick this filter fly problem. At state operators' meetings, discussions on this problem ranked first in importance to the author. Many operators claimed to have none, or at the most only a few flies at their plants. Perhaps because they did not have to live with them, many did not regard the flies as a nuisance. The author might have had the same attitude if it had been possible to get away from the treatment plant after work.

Flooding Not Successful

At that time little was known about control of filter flies other than flooding the bed. Some operators felt that the presence of a good colony of water springtails, *"achorutes viaticus,"* in the filters would keep flies from becoming a nuisance. With the cooperation of the State Health Department, that at Litchfield was one of several filters in the state to be "seeded" with springtails. However, no reports were forthcoming that the experiment was in any way a positive factor in fly control; at this plant the growth of springtails never became established. From 1939 until 1945 filter flies were present in spite of flooding the filter every ten days. Sometimes flooding helped, but most of the time is was not worth the effort.

Flooding is an objectionable practice since sewage receives only primary treatment while this is being done, and the unloading of the entire bed adds to pollution. Flooding would, of course, be justified if—and only if—definite control was obtained. Since there was no relief at Litchfield, flooding was finally stopped altogether.

New Chemical Methods

Following the last war, the new insecticide DDT was proclaimed as the answer to the problem. The results of experiments and full-scale work were published in technical magazines covering the sewage field.

In May, 1947, DDT was first tried as a 30 per cent concentrate. To assure good distribution over the entire filter, a container with a petcock was used, and the flow of DDT into the filter feed was timed to allow the distributor to make eight complete revolutions. Methylene blue was used as an indicator to show when the DDT reached the filter. The indicator was injected into the pump suction as the pump started, and when color appeared in the distributor discharge it indicated the presence of DDT. The time of passage was determined and used in future tests. Immediately after dosing, flow of sewage to the bed was stopped for two hours. The results of this initial treatment were amazing. The flies came up in tremendous numbers and in a short while the whole surface of the bed was a mass of dying larvae. This treatment was good for about thirty days, and for the first three weeks there was hardly a fly noted.

From then on, the treatment was repeated with the same dosage applied every two weeks at first, and later at shorter intervals. Results were fairly satisfactory that year, and no concern was felt about 1948 as ten gallons of the concentrate were still on hand.

Flies Resist DDT

Early in 1948 the flies appeared again, only, it seemed, in greater numbers. After the neighbors started their usual complaints, DDT treatment was applied. For three months fairly good results were obtained although, as in the previous year, intervals between treatments were necessarily shortened as the season progressed. By August DDT no longer affected the flies or larvae because, as we learned later, they had built up an immunity. About that time a distinct change in the appearance and behavior of the flies was noted. They were smaller and less hairy but much quicker in their movements.

In early August, 1948, use of DDT was stopped and, for the rest of the

Fig. 1—BATTLEGROUND: The Litchfield, Ill., Sewage Treatment Plant.
Residence of Supt. Spiess in lower right corner, almost hidden by trees.

season, control by spraying and burning with gasoline was tried but conditions remained bad.

At the meeting of sewage treatment plant operators late in the year, many operators reported similar experience. Since one operator still claimed very effective control with DDT, its use was again started in 1949. As expected, results were nil. Late in June Dr. Bruce suggested that I try chlordane, a fairly new insecticide. A 30 per cent chlordane solution was applied in the same manner as DDT. After 1.5 hours most of the flies had died and larvae were on the surface in numbers defying imagination. In many places the filter surface was so covered with dead and dying larvae that the stones could not be seen. See Fig. 2. The results were most satisfactory and it once more appeared that the answer to this filter fly problem had been found. The one treatment was effective from June 23 to July 26, so effective that the plant was entirely fly free.

Four Insecticides Compared

On July 27 Dr. Bruce again came to Litchfield for more experiments, hoping to find another chemical that could be used to alternate with chlordane. The filter was divided into five parts: one was treated with chlordane; one with "497," which is now called "dieldrin"; one with BHC (benzene hexachloride 10 per cent isomer); one with DDT; and one was left untreated. One of the four insecticides used, "497" proved the best, chlordane and BHC were about the same, and DDT was the poorest. All treatments irritated the larvae, but only "497" gave a good kill.

For the months of August, September and October treatment was alternated with applications of BHC, lindane, and "497." On October 27 the original chlordane treatment was repeated, but without much success, and it was concluded that the flies had again built up a resistance. All in all, during 1949 control was not too bad and much experience was gained.

1950 Experience

In 1950 it was planned to have the plant painted and repairs made without flies being present, but they developed as rapidly as ever. Treatment and painting were delayed while waiting for Dr. Bruce to come and try a new control measure. He was delayed, so finally dismantling of the filter distributor was started on May 8. The next day, after work had progressed too far to stop, Dr. Bruce arrived with a dormant insecticide and fungicide called "D-N-289." The filter was sprayed by hand, and while this treatment killed many adult flies it did not affect the larvae which were going deep into the already drying bed of rock.

Three men required four days to clean and prepare the distributor for painting, and those were days of misery. Anyone not familiar with problems of this nature cannot imagine the working conditions. After about ten days, during which new generations of flies were continuously hatching, this job was delayed until the filter dried and the flies had died off. After that time, the paint job was rapidly completed and the filter again placed in operation on June 9.

The respite lasted until early in July, then one day a few flies were noticed, and on the following day the place was completely reinfested. BHC was reported to have worked very successfully at Ridgewood, N.J., therefore it was again applied at Litchfield in the usual manner. The following day it was decided that the Litchfield flies are of a hardy and rugged variety for BHC did not affect them. Dr. Bruce then concluded that possibly the heavy biological growth on the filter stone sheltered many larvae and prevented the insecticide from reaching them.

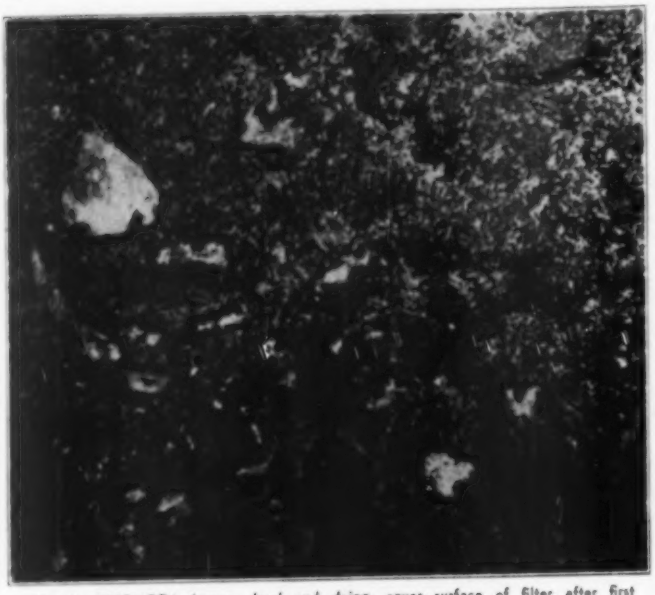


Fig. 2—PSYCHODA larvae, dead and dying, cover surface of filter after first treatment with chlordane.

On August 1, using a power sprayer, the filter was sprayed with an aquatic weed killer to eliminate part of the biological growth, and on August 11 it was treated with lindane. No effective results were obtained and the situation was considered discouraging since almost all of the known remedies had been tried and the flies were resistant to all applied.

On August 18 an application of "Tetra Ethyl Pyro Phosphate" (TEPP), a deadly poison, was tried. The filter was flooded and one liter of the material was introduced into the sewage flow so that it was spread in six rotations of the distributor. Then flow was stopped and the filter remained flooded over night. As all treatment methods were (by now) viewed with skepticism it was not surprising when, the next morning, flies were found to be as plentiful as ever. On August 23 an application of a second liter of TEPP was used with the same lack of success.

On October 17 the Central Section Sewage Works Operators' meeting was to be held at the Litchfield plant and the author was scheduled to speak on "How to Control Filter Flies." What a situation to be in, with flies now as thick as sand on a beach!

Then, as an answer to prayers, Dr. Bruce arrived with fifty gallons of high-grade fuel oil containing 4.0 per cent lethane, "384 special." The application procedure was changed at this time to obtain coverage of the underside of the stones. The filter was flooded to within six inches of the surface, the fuel oil mixture was added and the sewage level was then raised to cover the stone. After four hours the unit was drained and the next morning no live larvae or flies could be found. This treatment was effective for thirty days, but early in October the flies returned as strong as ever. With confidence in the power of fuel oil, 30 gallons of oil were applied as in the prior treatment, but the next morning flies and larvae were still there. It appeared that the lethane was responsible, and the results were reported to Dr. Bruce. He sent a new supply of fuel oil containing lethane. On October 14 the application of this mixture was repeated and results were as succesful as on August 30.

The day of the conference was a shirtsleeve day, with the temperature in the 80's, *and the plant was fly-free!* What a satisfaction; but what a narrow squeak. In discussions at the meeting, both Dr. Bruce and the author refrained from presenting any conclusions.

Progress in 1951

The start of the 1951 season was the same as all others—more flies. Since DDT hadn't been used the previous year, it was hoped the flies would have lost their resistance to it and on June 1 it was given a trial. Five gallons of 25 per cent concentrate were applied as in the first successful treatment, but it prove ineffective.

In 1950 Chem-Larv was extensively used at Ridgewood, N. J. in place of the BHC which had apparently not lived up to results reported earlier. On the strength of the widely publicized success of this material, Jim Williams, San. Engr., State Dept. Health, treated the Litchfield filter with Chem-Larv on June 7. One and one-half gallons of material were used after the filter was nearly flooded, applied during approximately three rotations of the distributor arms. No changes were noted in the next two days; larvae and flies were still alive. On the third day a few dead larvae were found but the living larvae and fly population were increasing.

Apparently chlordane in Chem-Larv is no better than chlordane alone. At current prices approximately $16.00 worth of material was used. The amount applied is somewhat less than that advocated by the Chem-Larv Co., but the application was made so as to confine treatment to the upper two feet of filter media. On this basis, treatment should have been adequate and within dosage recommendations.

Later Dr. Bruce provided five gallons of DDT reinforced with "Dimite" to increase its strength, and five gallons of a soil poison, trichlorobenzene. The DDT was applied first, with no effect, and the soil poison after about four days but again with no beneficial results.

Trichlorobenzene

On June 21 the filter was flooded within six inches of the surface, 2.5 gallons of trichlorobenzene was applied, the water level was raised to cover the stone, and the filter remained flooded all night. The next morning there were no flies or larvae and complete control persisted until July 10. On that day, without flooding, the filter, another 2.5 gallons of the chemical was applied and the filter was rested for two hours after the application; this treatment was not successful. The following day, treatment was again carried out the same way as on June 21 and with complete success. Effective control was obtained through August 24 by repeating treatment every seven to eleven days.

The soil poison was found to affect only adult and larvae forms, and not the egg. On about the fifth day after each treatment with trichlorbenzene, a few square feet of stone was sprayed with any insecticide to irritate the larvae and bring them to the

surface for inspection in order to determine when treatment was again needed. In this way the flies never developed beyond control. The practice was to start flooding shortly before noon. The treatment was then completed by early evening and the flooded filter allowed to stand until early the following morning.

Soil Poison Persistence

Beginning on August 1, a slow but steady decrease in the quality of the plant effluent was noticeable, and the filter clogged a little causing some pooling. Chlorine was then applied at the rate of 40 pounds per day but still the clogging did not disappear. From then on, pooling was eliminated solely by scarifying. Could it be that the soil poison also killed bacteria and thus seriously affected the biological process? Dr. Bruce had stated that a soil poison treatment on a plot of land was effective for about five years in the control of termites.

Starting August 24 the established method of flooding the filter was followed at intervals of from one to two weeks, without addition of any soil poison or other chemical, and with complete success. No outbreaks of flies occurred and it appeared that there was enough soil poison left on the rocks to continue effective control.

From long years of experiments, the soil poison seems to be the answer to our particular filter fly problem. The mechanism of its action is uncertain, but it seems to penetrate the biological growth on the filter where it can remain in contact during flooding. While the physical appearance of the plant effluent seemed worse than usual after several applications of the poison, the relative stability test indicated no deterioration. The stream conditions, as measured by dissolved oxygen content and visual observation of aquatic life, seemed normal.

Since trichlorobenzene is a strong poison and may carry through the plant to the receiving stream or damage the growth on the filter stone, it must be used carefully. The author plans to continue its use in 1952 and hopes to obtain more definite information regarding its effects.

As a matter of interest, the following are costs of a single chemical treatment for the amount used: chlordane, $20; lindane, $50; lethane, $40; DDT, $10.50; and soil poison, $2.

Acknowledgement

The author expresses his thanks to Dr. Bruce for his time and guidance in this work, and to Bill Hasfurther of the State Sanitary Water Board for his assistance in preparing this report.

Water and Sewage Plant Power Tests*

Value of the Graphic Wattmeter

Operators of water and sewage plants sometimes have occasion to check electrical power. If the power is purchased from a central station it is usually well to know whether all of the power paid for is utilized most effectively.

For this purpose the graphic wattmeter is the most widely used. It measures loads and shows the loads graphically, making the facts readily understood. It assists in analyzing machinery. Thus if a certain machine is giving you trouble the graphic wattmeter will probably show just what is wrong or will indicate how the trouble can be eliminated. If a machine or pump is used intermittently the graphic wattmeter shows when the unit operates, how often, and it shows the load at each using. It is by far the most versatile and useful of all electrical instruments.

For instance, one large and well known producer of food products effected a saving of over $10,000 per year by making a thorough study of its electrical power. It was found that a surprising percentage of the power was lost in grounds. The power factors were not good and were improved. Individual motors were studied and machine operation improved throughout the plant.

Thus in one instance they were using a 25 h.p. motor to drive a special "shaking machine" for salvaging and cleaning bags. The investigation proved that the motor was entirely too large for the machine it was driving. They are now driving that machine with a 1 h.p. motor instead of the 25 h.p. motor.

Operators of small plants are inclined to say, "That is all very well for big plants, but we don't use nearly that much power. We doubt whether it will pay us to buy a graphic wattmeter."

That, of course, is an important point. But in general it is a small plant indeed that cannot afford to do some checking up of power once in a while. It may not pay you to buy a wattmeter, true, but if there is a testing engineer or specialist in your vicinity who is equipped with apparatus for such work, his charge for making the test and the possibility of more than saving that cost might be worth discussing with him. If his charge would be $25 and if you might save $100 per year as a result—would that be worthwhile to you? Your losses may be much higher than you think, particularly if you have no way in which to conduct an occasional test yourself. A graphical wattmeter is an excellent tool to have access to if outright ownership can not be justified.

* Contributed by W. F. Schaphorst, M.E.

Officers of the South Dakota Water and Sewage Conference—1952

(Front Row)—Chas. E. Carl, Secy.-Treas.; G. Gunderson, Director; Wallace Johnson, President; Art Hansen, Vice-Pres. (Back Row)—Sam Van Hise, Director; Francis McNeary, Director.

Water and Sewage Problems in Reactivating Service Bases

by M. H. BIDWELL*, *Assoc. Public Health Engr., Bureau of Health, Rochester, N.Y.*

DURING World War II, the U.S. built many large military bases throughout the country. These were completely equipped with all needed sanitary facilities, obviously at great cost. After the war much of the equipment at the bases was disposed of through War Assets Administration, vandalized, or allowed to deteriorate. With the present trend toward defense and military expansion, some bases are being reactivated and existing water and sewage facilities must be repaired and placed in operating condition. The following notes discuss a few of the many perplexing problems confronting the sanitary engineer responsible for reactivation of sanitary facilities at armed services bases.

At first glance it might seem quite possible simply to enter one of these already established bases, turn on the power and start operation. This was apparently the logic behind the decision to use, for example, one such base located in northern California. In 1943 this base had a capacity of 60,000 troops. It had a complete water system consisting of seven wells, a pumping station, chlorination equipment, some 40 miles of distribution system, and a storage reservoir of 3.0 mg. capacity. The sewage system also was complete. It included some 40 miles of sewers, two lift stations, a grit chamber, a primary clarifier, two bio-filters, a final clarifier, a chlorine contact tank, chlorination equipment, three sludge digestion tanks, sludge drying beds, all essential pumping and recirculation equipment, and a complete laboratory.

Water and Sewage System Repairs

Present plans call for making this base available for handling 15,000 troops. Power originally was purchased and is still available. The wells no longer were capable of being pumped until cleaning and freeing the strainers. It was decided that two wells would serve the anticipated needs for water, and a contract was let for their reconditioning. Replacement of some piping at the well site was required; pumps and motors were provided; and all valves were repacked and repaired. The reservoir is located about six miles from the base and is much larger than is needed. It is an earth bottom basin on the knoll of a small hill and has a wooden framed cover. The screening over the vents required replacement, as did some of the wooden members comprising the cover.

The original distribution system was of a cheap well casing type with an expected life of about ten years, and had deteriorated to an alarming degree. Breaks and leaks were numerous. About 75 per cent of the system has been valved-off for the present and at least 30 major breaks exist in the balance of the system.

Pumping has been at the rate of nearly 400 gallons per capita per day. Even at this high rate, many sections of the base (particularly warehouses) are without adequate or any fire protection. It will be a costly and continuous job to keep this system in operation, if it can be done at all. Consideration has been given to the relining of parts of the system with concrete. It is the opinion of the writer that the only economical and satisfactory solution to this problem is the replacing of many sections of pipe.

The chlorination equipment was missing. It has been replaced and now is in operation. Because all service lines are taken from the distribution main, it has been impossible to obtain any residual chlorine in the reservoir located at the far end of the system. With the present pumping and consumption rates there is probably very little turnover in the reservoir; it can serve only as a pressure regulator and reserve supply floating on the line.

Bacterial Contamination

The medical officer at this base became alarmed at the lack of residual chlorine in the reservoir and the presence of coliform organisms in the distribution system. Residual chlorine was maintained throughout the water consuming area of the base. As some pollution might enter the reservoir, it was drained, cleaned, repaired and treated with a large dose of high test hypochlorite in refilling. The coliform organisms still were present in the consuming areas. Considering the numerous breaks in the water lines and the condition of the nearby sewers, the source of these coliform organisms appears rather obvious. The only solution to the problem will be to provide tight sewer lines and tight water lines.

The sewer lines appear to have shifted somewhat with time. They are much overdesigned for the present and future expected loads. It is impossible to obtain self cleansing velocities at any point and frequent flushing will be required. The main trunk line, about three miles long, is a 33 inch V.C. pipe laid on minimum grade. There is little more than a trickle of sewage reaching the plant with about 1500 men stationed on the base.

The Sewage Problem

All sewage treatment plant equipment had been either vandalized or disposed of through War Assets Administration. Nothing was in operating condition. The grit chamber has now been by-passed and the basic pumping and other equipment replaced. One clarifier and one filter have been placed in operation. Each unit is 100 feet in diameter and has excess capacity for the 15,000 anticipated population. In an attempt to overcome the excess capacity, sewage is being recirculated at a 2000 gpm. rate. This volume just about keeps the filter wet. The chlorinator has been placed in operation but no laboratory facilities have yet been provided.

A solution to the sewage treatment problem would require a smaller clarifier and, also, redesign of the filter distribution system in order to make use of a much smaller area. Experience at this base points out quite clearly the advantage of providing a number of small units with flexible operation where there may be extreme fluctuations in load, rather than installing single large units.

Experience Elsewhere

At another base, it was found that about 2200 ft. of 16-inch C.I. main had been removed from the street. Unhappily, this main was the feed line to the storage reservoir. The same base likewise has the problem of reducing the capacity of existing sewage treatment facilities.

At still another base an attempt is being made to operate an over-sized

*Formerly Sanitary Engineer, Continental Air Command, U.S.A.F.

activated sludge plant. A municipal sewage treatment plant is located only 100 feet away and has ample capacity to take the base sewage. The municipality is willing and able to relieve this situation and economy dictates the completion of a contract to this end as quickly as possible.

The problems discussed above are only a few of those the sanitary engineer must meet at bases throughout the country. He is called upon also to develop insect and rodent control programs where needed, to arrange for satisfactory garbage, trash and refuse collection and disposal, and to advise officials of the bases on many other general sanitation problems.

A Method of Foam Control At Activated Sludge Plants

by J. McNICHOLAS, *Supt. Sewage Works, Burgh of Motherwell and Wishaw, Scotland*

Abstracted by C. E. Keefer*, Editorial Associate

(From *The Water & Sanitary Engineer*, Jan., 1952.)

FOAMING to a depth of 5 or 6 ft. frequently occurs on the aeration tanks at the Clyde Park Sewage-Treatment Works, Burgh of Motherwell and Wishaw, Scotland. About the end of 1950 a small discharge of fuel oil, estimated to be not more than 24 gallons per day reached this activated-sludge plant and flowed into the aeration tanks. Upon the entry of the oil into these tanks foaming quickly subsided. However, the final effluent deteriorated, resulting in an increase in B.O.D. from 8 to 20 ppm. and in suspended solids from 5 to 45 ppm.

To verify the effect of oil in reducing foaming a small quantity of mineral lubricating oil was sprayed on the surface of the aeration tanks when foaming was particularly pronounced. Within about 3 hours foaming was greatly reduced; it took another 6 hours for the foam to build up again. As a further check on these observations 0.6 pint of mineral lubricating oil was sprayed on the surface of the aeration tanks, the capacity of which is 600,000 gal. If it is assumed that the oil weighed 7.5 lb. per gal. the instantaneous concentration of the oil was 0.11 ppm. McNicholas estimates that the actual concentration of oil entering the final settling tanks was a good deal less than the above-mentioned amount. The accompanying photographs from left to right picture the aeration tanks before the addition of the oil, ¾ hr. later and 2½ hrs. after the addition of the oil. A microscopical examination of the sludge indicated that *Vorticella* and *Carchesium* were still active. Furthermore, there was no increase in the B.O.D. of the final effluent, which was 8 ppm.

Oil is now added to the aeration tanks to control foaming when it becomes necessary to clean the greasy concrete walks on the aeration tanks or whenever this foam is blown into the adjacent public park.

McNicholas states that foaming occurs only when a plant is in good operating condition. When the load on the plant is excessive or when the normal dry weather flow is greatly augmented during wet weather, foaming does not occur. Bright sunlight also appears to have a depressing effect on foaming. This observation, however, is subject to further verification. Foaming is most intense from late evening until early morning and also after weekly wash-days.

*Deputy Sewerage Engineer, Bureau of Sewers, Baltimore, Md.

FOAMING—Clyde Park Sewage Treatment Works, Burgh of Motherwell and Wishaw, Scotland.
Left—before addition of mineral oil; *center*—¾ hr. after addition of oil; *Right*—2½ hrs. after addition of oil.

Nomograph to Determine Weight of Steel Rod

by W. F. SCHAPHORST, *M.E. Newark, N.J.*

HERE is a chart that will be appreciated by many readers who have to do with steel rods—or even discs. It gives us the weight of any steel rod in ordinary use, whether solid or hollow, and any disc up to 10 in. in diameter.

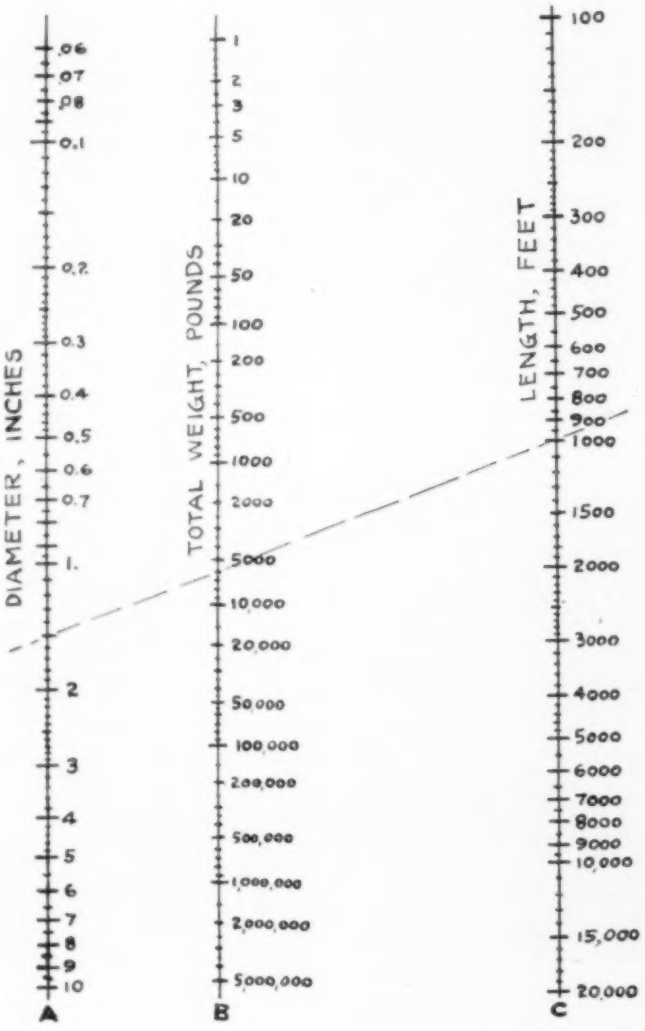
To determine the weight of a steel rod 1.5 in. in diameter and 1000 ft. long: Run a straight line through the 1.5 in column A and the 1000 in column C and column B immediately tells us that the weight of the rod is 6000 pounds.

As will be noted the range of the chart for this sort of computation is very wide—from diameters of 0.06 to 10 in.; and lengths of 100 ft. to 20,000 ft.

The chart is easily applicable to *any* length by simply shifting the decimal point. Thus since the above 1000 ft. of rod will weigh 6000 pounds it is obvious that one foot will weigh 6 pounds. Simply shift the decimal point three places to the left. Or, a piece only 0.1 ft. long will weigh 0.6 lb. Or, 0.01 ft. long, 0.06 lb.; 0.001 ft. long, 0.006 lb. The latter, of course, would be known as "discs" rather than rods.

Again, let us suppose that the above rod 1000 ft. long is hollow—that the inside diameter is 0.5 inch. What is the weight of the hollow rod? In that event find the weight of a 0.5 in. rod 1000 ft. long and subtract that weight from 6000 lbs.

The chart tells us that the 0.5 in. rod to be deducted would weigh 700 lb. Subtracting 700 from 6000 we find that the hollow rod whose length is 1000 ft. and inside and outside diameters 0.5 in. and 1.5 in. respectively would weigh 5300 lb. One foot of that rod would weigh 5.3 lbs. One-tenth of a foot would weigh 0.53 lb. A disc 0.001 ft. thick would weigh .0053 lb. And so on.



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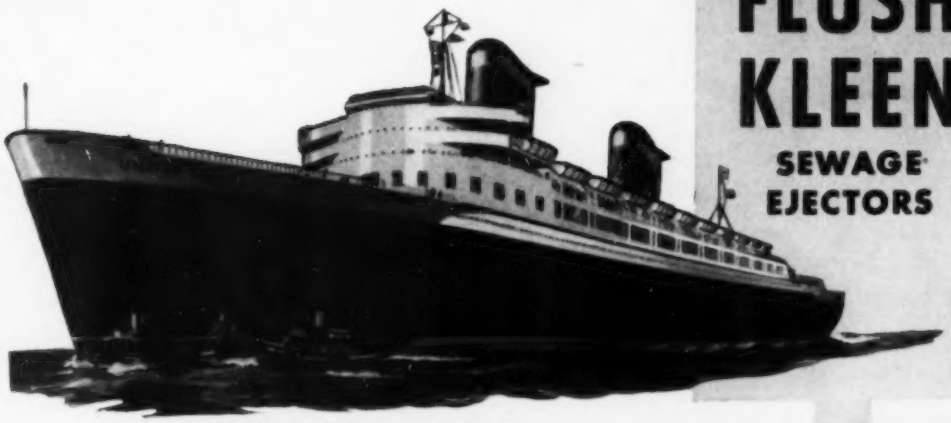

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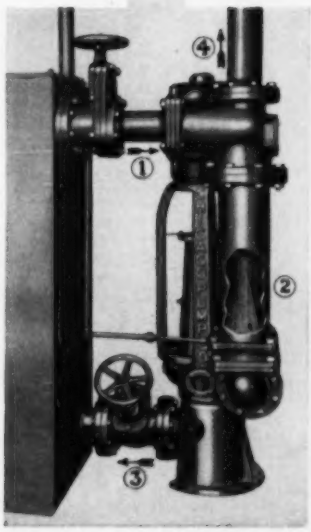
If you do not have all the facts about FLUSH-KLEEN EJECTORS, please request Bulletin No. 122—it will be sent to you promptly.



The positive clog-proof operation of FLUSH-KLEEN EJECTORS is readily understood by referring to the cut-away illustration.

FILLING WET WELL—(1) Sewage flows through inlet pipe. (2) Sewage solids are retained by strainer. (3) Strained sewage flows through idle pump to basin.

PUMPING—(3) Strained sewage is pumped from basin. (2) Sewage solids are backwashed from strainer. (4) Special check valve closes; sewage and solids are pumped overboard.

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Meetings Scheduled

June 4-6—Auburn, Ala. *(Pitts Hotel)*
ALABAMA WATER & SEWAGE ASSOCIATION. Sec'y, Alex O. Taylor, Box 69, Alabama Polytechnic Institute, Auburn, Ala.

June 11—Houlton, Maine
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, Winthrop Water District, Winthrop, Me.

June 12—Portsmouth, N.H. *(Hotel Wentworth-by-the-Sea)*
NEW ENGLAND WATER WORKS ASSOCIATION (June Conference) Sec'y, Jos. C. Knox, 204 Tremont Building, Boston, Mass.

June 18-20—Erie, Pa. *(Lawrence Hotel)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, State Dept. of Health, Greensburg, Pa.

June 25—Martinsville, N.J. *(Martinsville Inn)*
NEW JERSEY SECTION A.W.W.A. (Summer Outing). Luncheon at Inn, Inspection of Elizabethtown's Millstone-Raritan Filter Plant. Sec'y, C. B. Tygert, Box 178, Newark, N.J.

June 25-27—Madison, Wis. *(Loraine Hotel)*
CENTRAL STATES SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, A. Paul Troemper, State Dept. of Health, Springfield, Ill.

Aug. 13—Machias, Maine
MAINE WATER UTILITIES ASSOCIATION. Earle A. Tarr, Winthrop Water District, Winthrop, Me.

Aug. 24-27—Los Angeles, Calif. *(Shrine Convention Hall & Ambassador Hotel)* AMERICAN PUBLIC WORKS ASSOCIATION. (Congress & Equipment Show) Exec.-Dir., D. F. Herrick, 1313 East 60th St., Chicago 37, Ill.

Aug. 25-27—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA WATER WORKS OPERATORS ASSN. Sec'y, R. Rupert Kountz, Pennsylvania State College, State College, Pa.

Aug. 27-29—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

Sept. 3-5—Upper Saranac, N.Y. *(Saranac Inn)*
NEW YORK SECTION A.W.W.A. Sec'y, Rollo K. Blanchard, 50 West 50th St., New York, N.Y.

Sept. 8-10—Groton, Conn. *(Hotel Griswold)*
NEW ENGLAND WATER WORKS ASSOCIATION (Annual Meeting). Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Sept. 3-13—Chicago, Ill. *(Conrad Hilton)*
AMERICAN SOCIETY OF CIVIL ENGINEERS. (Centennial Celebration). Sec'y, Wm. N. Carey, 33 West 39th St., New York, N.Y.

Sept. 9-11—Grinnell, Iowa *(Grinnell College)*
IOWA SEWAGE WORKS ASSOCIATION. Sec'y, Leo Holtkamp, Box 310, Webster City, Iowa.

Sept. 10-12—Sioux Falls, S.D. *(Hotel Cataract)*
MINNESOTA SECTION A.W.W.A. Sec'y, L. N. Thompson, Water Dept., St. Paul, Minn.

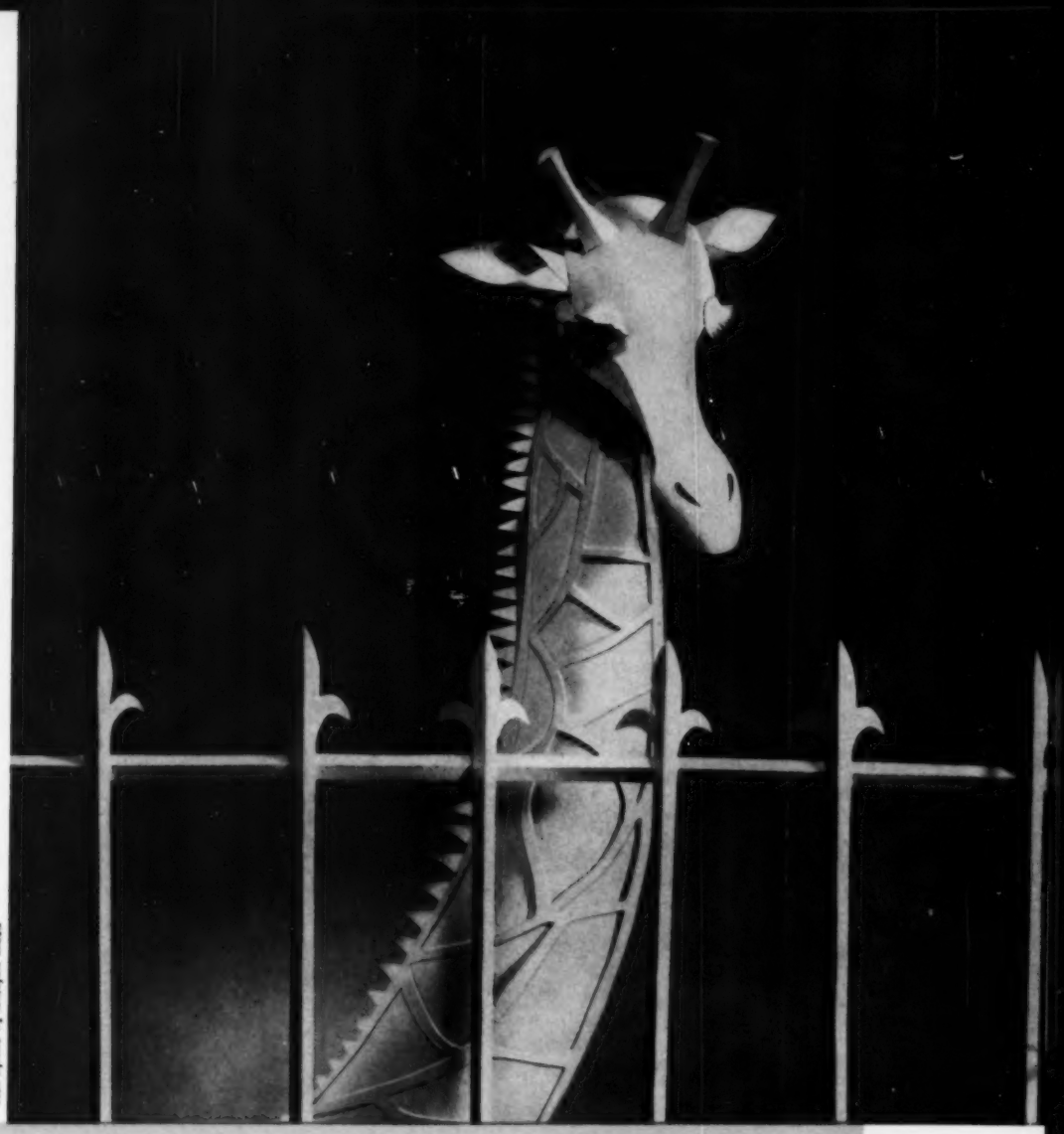
Sept. 15-17—Knoxville, Tenn. *(Andrew Johnson Hotel)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, R. P. Farrell, Dept. of Public Health, 420 6th Ave., Nashville, Tenn.

Sept. 15—Cheyenne, Wyo. *(Frontier Hotel)*
ROCKY MOUNTAIN SEWAGE WORKS ASSOCIATION. Sec'y, C. E. Harness, 272 City & County Bldg., Denver, Colo.

Sept. 16-17—Cheyenne, Wyo. *(Frontier Hotel)*
ROCKY MOUNTAIN SECTION A.W.W.A. Sec'y, Geo. J. Turre, Box 600, Denver, Colo.

Sept. 16-18—Madison, Wis. *(Hotel Loraine)*
WISCONSIN SECTION A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison 3, Wis.

Sept. 17-19—Pierre, S.Dak. *(Hotel St. Charles)*
SOUTH DAKOTA WATER & SEWAGE WORKS CONFERENCE. Sec'y, Charles E. Carl, State Board of Health, Pierre, S.Dak.



LONG ON EXPERIENCE

Many years ago, Niagara pioneered in the application of liquid chlorine for water purification. Since that time its

NIALK® *Liquid Chlorine*

has remained unsurpassed for use in water and sewage sanitation.

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Liquid Chlorine • Caustic Potash • Carbonate of Potash • Paradichlorobenzene • Caustic Soda • TRICHLORethylene
NIAGATHAL® (Tetrachloro Phthalic Anhydride)

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about **DISSOLVED AIR FLOTATION SYSTEMS**

for **SUSPENDED SOLIDS SEPARATION**

Bulkley-Dunton's staff of highly skilled Water Treatment Engineers specializes in developing systems and processes for the separation of

- **Suspended Solids** • **Oils and Greases**
- **Recoverable By-Products** • **Industrial Wastes** from process and effluent flows.

Many leading industries have availed themselves of this money-saving specialized Engineering Service to:

- Recover former waste materials
- Recover Water for re-use
- Solve Pollution Problems
- Augment Existing Facilities

Some of the many industries where Bulkley-Dunton can help you:

- Meat packing
- Paper manufacture
- Chemical production
- Carbon separation
- Soap manufacture
- Petroleum refining
- Petroleum production
- Railroad maintenance
- Fruit & vegetable canning
- Automotive industry
- Leather & tanning
- Glue & gelatin manufacture
- Beet & cane sugar refining
- Fish canning
- Wine distilling

It will definitely pay you to investigate Bulkley-Dunton's Water Treatment Engineering Services. Write for details to

BULKLEY-DUNTON PROCESSES, INC.

295 MADISON AVENUE, NEW YORK 17, N. Y.
Pacific Coast: Security Bldg., Pasadena 1, Cal.

Meetings Scheduled

(Continued from page 100A)

Sept. 18-19—Cincinnati, Ohio *(Netherland Plaza Hotel)*
OHIO SECTION A.W.W.A. Sec'y, M. E. Druley, Dayton Power & Light Co., Wilmington, Ohio.

Sept. 21-23—Jefferson City, Mo. *(Governor Hotel)*
MISSOURI SECTION A.W.W.A. MISSOURI WATER & SEWAGE CONFERENCE. Sec'y, W. A. Kramer, State Office Bldg., Jefferson City, Mo.

Sept. 24-26—Battle Creek, Mich. *(Post Tavern)*
MICHIGAN SECTION A.W.W.A. Sec'y, T. L. Vander Velde, Dept. of Health, Lansing 4, Mich.

Oct. 2-3—Parkersburg, W.Va. *(Chancellor Hotel)*
WEST VIRGINIA SECTION A.W.W.A. Sec'y, H. K. Gidley, State Dept. of Health, Charleston, W.Va.

Oct. 6-9—New York, N.Y. *(Statler Hotel)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSOCIATIONS (Annual Meeting). Exec.-Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill. (and) NEW YORK SEWAGE & INDUSTRIAL WASTES ASSOCIATIONS. Sec'y, Ralph C. Sweeney, 21 N. Broadway, White Plains, N.Y.

Oct. 8—Bethel, Maine
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, Winthrop Water District, Winthrop, Me.

Oct. 12-15—Tulsa, Okla. *(Mayo Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

Oct. 14-17—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 20-22—Pittsburgh, Pa. *(Wm. Penn Hotel)*
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA. Sec'y, William Porter, Wm. Penn Hotel, Pittsburgh 30, Pa.

Oct. 20-24—Cleveland, Ohio *(Public Auditorium)*
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y, Mrs. W. R. Walsh, A.P.H.A., 1790 Broadway, New York, N.Y.

Oct. 23-25—Atlantic City, N.J. *(Hotel Madison)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 23-24—Portland, Ore. *(Multnomah Hotel)*
PACIFIC NORTHWEST SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Robert O. Sylvester, More Hall, University of Washington, Seattle 5, Wash.

Oct. 23-25—Mason City, Iowa *(Hanford Hotel)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

Oct. 28-31—Pasadena, Calif. *(Huntington Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, John C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

Oct. 29-31—Washington, D.C. *(Wardman Park Hotel)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, Carl L. Lauter, 6955 33rd St., Washington, D.C.

Nov. 3-5—Montebello, Quebec *(Seigniory Club)*
CANADIAN INSTITUTE OF SEWAGE & SANITATION. (Annual Meeting). Sec'y, Dr. A. E. Berry, Parliament Bldgs., Toronto, Ont.

Nov. 5-7—Old Point Comfort, Va. *(Chamberlin Hotel)*
VIRGINIA SECTION A.W.W.A. Sec'y, W. H. Shewbridge, Regional Engr., 708 State Office Bldg., Richmond, Va.

Nov. 10-12—Hendersonville, N.C. *(Hotel Skyland)*
NORTH CAROLINA SECTION A.W.W.A. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 16-19—Pensacola, Fla. *(Hotel San Carlos)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, C. W. White, State Board of Health, 519 Dexter Ave., Montgomery 4, Ala. (Joint Meeting).
FLORIDA SECTION A.W.W.A. Sec'y, M. R. Boyce, 504 Pennsylvania Ave., Clearwater, Fla.

Dec. 4-6—Havana, Cuba
CUBAN SECTION A.W.W.A. Sec'y, L. H. Daniel, Baratillo 9, Havana, Cuba.

Dec. 7-10—Cleveland, Ohio *(Hotel Cleveland)*
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. (Annual Meeting). Sec'y, F. J. Van Antwerpen, 120 East 41st St., New York 17, N.Y.

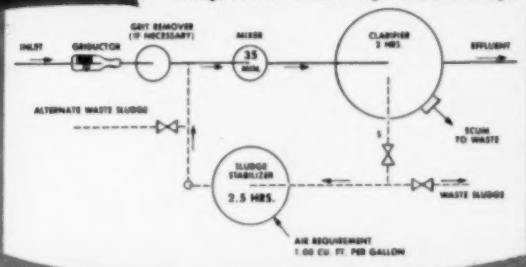
Dec. 10—Winthrop, Maine
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, Winthrop Water District, Winthrop, Me.

Here's New Data!

Infilco's Biosorption Process

Write for data on Infilco's new activated sludge treatment method. Ask for Bulletin No. 6550.

Suggested flow diagram with retention based on average flow of normal strength domestic sewage



AFTER SEVEN MONTHS

in actual operation... the Biosorption Process is showing phenomenal results in high-rate biological oxidation sewage treatment.

IMPORTANT SAVINGS

in space requirements and initial investment are brought about with total retention time of only about five hours. B.O.D. and suspended solids reductions compare with the optimum obtained by conventional activated sludge treatment methods. Write today for this important test data on the BIOSORPTION PROCESS... ask for Bulletin No. 6550.

RESULTS FROM ACTUAL INSTALLATION
Sewage Treatment Plant, Austin, Texas

SEVEN MONTHS TEST PERIOD	B.O.D. % REDUCTION	SUSPENDED SOLIDS % REDUCTION
AVERAGE	93.9	94.9
MAXIMUM	98.0	98.0
MINIMUM	88.5	90.3

RETENTION TIME ONLY FIVE HOURS

INFILCO since 1894

INFILCO INC. *Tucson, Arizona* | *Plants in Chicago & Joliet, Illinois*

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

Lieutenant Stanley T. Adams Medal of Honor

ONE BITING-COLD FEBRUARY NIGHT, Lieutenant Adams was on a bitterly contested hill near Sesim-ni, Korea. Out of the dark earth the silhouettes of some 150 Communist troops rose up against the skyline. Ordering fixed bayonets, the lieutenant, with only 13 men, leaped up and charged furiously against the overwhelming odds. He was knocked down by a bullet. At least three hand grenades actually bounced off his body before exploding nearby. But when Adams and his squad were through, there were only 50 Communists left on the hill—and they were dead.

"Nobody likes to kill," says Stanley Adams. "Nobody likes war. But today the surest way to invite a war is to be weak. You and I know that twice in the last ten years Americans have let their guard down. And the Philippine and Korean graveyards are filled with men who paid the price for it.

"Please don't make that tragic mistake again. Remember that in the world today, *peace is only for the strong*. Help make your country and your armed services stronger still—by buying more . . . and more . . . and more U. S. Defense Bonds. Put *your* bond-power behind *our* fire-power, *now*—and together we'll keep America at peace!"

* * *

Remember that when you're buying bonds for national defense, you're also building a personal reserve of cash savings. Remember, too, that if you don't save *regularly*, you generally don't save at all. So sign up today in the Payroll Savings Plan where you work, or the Bond-A-Month Plan where you bank. For your country's security, and your own, buy U. S. Defense Bonds now!

Peace is for the strong... Buy U. S. Defense Bonds now!

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EXCELLENCE OF QUALITY - - EFFICIENCY IN DESIGN

A tradition of superior craftsmanship with the most modern facilities produce McDonald Waterworks Brass. Above are three Corporation Stops: inlet end is Mueller threaded, outlet end, as shown, for threaded iron pipe, Mueller Service pipe thread for copper tubing, and with lead flange union coupling. Ask us for our illustrated brochure showing our complete line of Waterworks Brass. A. Y. McDonald Mfg. Co., Dubuque, Iowa.

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BRASS GOODS • PUMPS • OIL EQUIPMENT

Dependable
HELLIGE
Water Testing Equipment
USED WITH CONFIDENCE
...EVERYWHERE

COLORIMETRIC COMPARATORS
Employing
GUARANTEED NON-FADING
Glass Color Standards
for pH, Chlorine, and 22 other important Tests.

AQUA TESTER for Analyses of Water, Sewage, and Industrial Wastes
Employs GUARANTEED NON-FADING Glass Color Standards for 30 tests including pH, Fluoride, Iron, Color of Water, etc. ...Uses Approved A.P.H.A. and A.W.W.A. Methods.

"Chromatron" PHOTOELECTRIC COLORIMETER & TURBIDIMETER
for Diverse Water and Sewage Tests.

TURBIDIMETER
The Turbidimeter Without Standards
for Turbidity Measurements and Sulfate Determinations.

TWIN-KIT for
pH Control and Chlorine or Bromine Determinations of Swimming Pool Water with GUARANTEED NON-FADING Glass Color Standards.

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877 STEWART AVENUE, GARDEN CITY, N.Y.

Exhibits at Kansas City Thought to be Best Ever

Many of those in attendance at the Kansas City Convention of the Am. Water Works Assn. expressed the opinion that the manufacturers' exhibits there were the best and most instructive ever put on by the manufacturers.

Eighty-seven member firms of the Water & Sewage Works Mfrs. Assn. were represented in the exhibit hall which scintilated with color and lighting effects and drew an exceptionally large number to see what's new or improved in the way of equipment and materials.

The 87 firms exhibiting were as follows:

Alabama Pipe Co.
American Cast Iron Pipe Co.
American City Magazine
American Well Works
Armco Drainage & Metal Products
Atlas Mineral Products Co.
Automatic Pump & Softener Corp.

Bacharach, Inc., E. W.
Badger Meter Mfg. Co.
Baker & Company, Inc., R. H.
Barrett Division, The
Allied Chemical & Dye Corp.
Buffalo Meter Co.
Builders-Providence, Inc.
Burroughs Adding Machine Co.

Calgon, Inc.
Centriline Corp.
Chicago Bridge & Iron Co.
Clow & Sons, James B.
Culligan Zeolite Co.

Darling Valve & Mfg. Co.
Davis Manufacturing Co.
De Laval Steam Turbine Co.
Dorr Company, Engrs., The
Dresser Manufacturing Div.
Dresser Industries, Inc.

Electro Rust-Proofing Corp.
Engineering News-Record

Fairbanks, Morse & Co.
Fischer & Porter Co.
"Flexible" Pipe Cleaning Co.
Ford Meter Box Co.

General Electric Co.
Golden-Anderson Valve Sp'clty Co.

Hanks Co., Fred W.
Harco Corp.
Cathodic Protection Div.
Hays Manufacturing Co.
Hersey Manufacturing Co.
Homelite Corp.
Hydraulic Development Corp.

The practical, economical answer to your underdrain problems

LEOPOLD
Glazed Tile
FILTER BOTTOMS

Successfully serving over 200 PLANTS with a daily capacity of over THREE-QUARTER BILLION GALLONS!

The Leopold Duplex Filter Bottom is made up of individual blocks, each weighing about 100 pounds, which are firmly joined together to provide a strong bed that is not disturbed by wash water. With this efficient, enduring system, you're assured an equal collection of filtered water with extremely low loss of head. There is no possible corrosion or tuberculation anywhere in the filter bottom.

Made of dealred fire clay—vitrified and salt glazed, the highly efficient Leopold Filter Bottom requires only shallow depth of small sized filter gravel and is acid and alkali resistant. Adaptable to any rectangular filter unit, it won't absorb any detrimental amount of water—and it's permanent.

Complete Water Purification and Sewage Plant Equipment . . .

- DRY CHEMICAL FEEDERS
- FILTER OPERATING TABLES
- MIXING EQUIPMENT

Write for details

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2413 W. Carson Street
Pittsburgh 4, Pa.

Industrial Chemical Sales Div.
West Va. Pulp & Paper Co.
Infilco Inc.

Johns-Manville
Johnson, Inc., Edward E.

Keasbey & Mattison Co.
Kennedy Valve Mfg. Co., The
Koppers Company, Inc.

Layne & Bowler, Inc.
Lindsay Company, P. K.
Link-Belt Company
Lock Joint Pipe Co.
Lone Star Steel Co.

McWane Cast Iron Pipe Co.
M & H Valve & Fittings Co.
Mathieson Chemical Corp.
Mueller Co.

Nat'l. Water Main Cleaning Co.
Neptune Meter Co.
Northrop & Co., Inc.

Omega Machine Co.

Permutit Co., The
Pitometer Co., The
Pittsbg.-Des Moines Steel Co.
Pollard Co., Joseph G.
Pratt Co., Henry
Preload Co., The
Price Brothers Co.
%Proportioneers, Inc.%
Public Works Magazine

Rensselaer Valve Co.
Rockwell Manufacturing Co.
Pittsbg. Equitable Meter Div.
Ross Valve Mfg. Co., Inc.

Simplex Valve & Meter Co.
Skinner Co., M. B.
Smith Mfg. Co., The A. P.
Smith-Blair, Inc.
Smith Co., S. Morgan
Sparling Meter Co.
Stuart Corp.

U. S. Pipe and Foundry Co.

Wachs Co., The E. H.
Walker Process Equipment Co.
Wallace & Tiernan Co.
Water & Sewage Works Magazine
Water Works Engineering
Watertower Paint and Repair Co.
Well Machinery & Supply Co.
Wood Co., R. D.
Worthington-Gamon Meter Div.
Worthington Corp.

Rockwell Announces New Water Movie

Rockwell Manufacturing Company, Pittsburgh, Pa., has announced a new motion picture entitled, "Made To Measure."

The new movie deals with how metering can contribute to a water conservation program. It also covers the operation of a meter to a water conservation program. It also covers the operation of a meter with respect to recommended procedures for maintenance and repair. The 16 mm film utilizes sound and color and has a running time of 30 minutes. It will be available for showings at association

Look! It's Really Portable—

RIDGID

"400" POWER DRIVE

On Wheels!

Wheel legs and front handles available to convert your present "400" to wheel model; or legs and tray to make bench model into stand.

Power for hand threaders, cutters, reamers now easily rolled where you need it!

★ *One man* can easily wheel-barrow this popular RIDGID power unit close to the work—think of the time and muscle saving!

★ And it stands still and delivers plenty of power—universal motor, forward, reverse, ⅛" to 2"—to 12" with geared tools.

★ RIDGID design 3-jaw chuck, 6 adjusting pinions, one always handy; self-centering workholder in rear.

★ Sealed-in lubrication—no oil to spill.

★ See it, compare it—buy the unequalled "400" at your Supply House!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID

Work-Saver Pipe Tools

Type VEU-GH Upright

Any RPM by dial control

GO MODERN with U. S. Varidrive, the miracle motor that changes to any selected speed, *instantly*. It can run slow, fast or at any speed in between, right to a split rpm. You don't have to change gears, shift belts or use a rheostat. Just turn a control dial. Entire unit is self contained, all on one base, embodying an asbestos-protected motor with a built-in speed control. Compact, streamlined. Smooth, quiet operation. Weatherproof. 2 to 10,000 rpm.

U.S. VARIDRIVE MOTOR

GET THIS BULLETIN

Describes U. S. Varidrives, with interesting color illustrations of various types and sizes ⅛ to 50 hp. Tells how to improve production. Mail Coupon.

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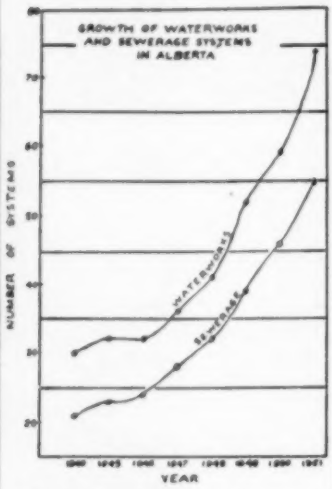
meetings, civic groups and educational institutions.



Alberta Boasts Impressive Growth in Water and Sewage Facilities

Largely the Result of Provincial Financing

The accompanying graph has come from J. A. Beveridge, Provincial Sanitary Engr., Edmonton, Alberta, who can justifiably take pride in the spectacular growth of water and sewage facilities in the Province of Alberta.

During the past two years the construction of these utilities has been financed by the Provincial Government at a cost of some $12,000,000. Another $5,000,000 has been earmarked for construction this year making a total of $17,000,000. One unique feature of this development is that systems are being installed in municipalities with populations as low as 320 persons. Another record is that no other province or state in North America has experienced such rapid expansion of sanitary utilities.

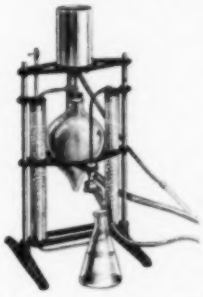
Congratulations to all concerned for such prowess which represents a significant rise in the standards of living throughout the Province.

Layne & Bowler Announces Movie on Ground Water Development

Layne & Bowler, Inc., Memphis, Tenn., has announced the completion of a new 16 mm color motion picture, with narration, on ground water development.

The picture, entitled "Deep Water," depicts a complete story of well water development from the initial

ENSLOW
Stability Indicator



For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

WRITE:

Phipps & Bird, Inc.
P. O. Box 2V Richmond 5, Va.

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MFG. CO.
607 Columbia Ave.
Darby, Pa.

survey through engineering, construction, testing and actual use.

Laynes "Deep Water" film in color is available for showing without cost to city councils, engineering clubs, schools, colleges, associations, governmental agencies and departments, and others interested in ground water development.

Highest T.V. Antenna in Little Rock, Ark.?

We are in receipt of the accompanying picture of the old standpipe in the back yard of "Les" Jackson, Little Rock's Supt. of Water. Atop this still useful structure has been mounted a T.V. antenna, which Jackson believes to be the highest in Little Rock, at least in point of off-the-ground height.

Jackson advises that this standpipe was erected some 70 years ago (possibly 75 years ago) and was moved from its original to its present location. It is of wrought iron construction and is apparently good for many years to come. It floats on the line, filling during the night and dropping 10 to 15 feet during the day.

The standpipe is 20 ft. in diameter, is 130 ft. high and holds 306,000 gallons. The antenna, just barely visible against the sky, consists of two bays. It was installed by Jackson's son assisted by Water Dept. personnel, the top bay being about 150 ft. above ground. Without such a high antenna TV reception in Little Rock (150 miles to good sending stations) is very sketchy and unsatisfactory about 50% of the time. Since "Les" Jackson has had TV piped into his home, shown in the foreground, he has become envied as the "TV King of Little Rock."

Little did the fabricators of this long-time useful wrought iron structure ever dream of its coming to be a dual-service structure after giving three score and ten years of service as a water supply facility.

Cement and Concrete Reference Book

Portland Cement Association, Chicago, Ill., has compiled a Cement and Concrete Reference Book containing interesting facts about the history, manufacture and uses of portland cement and concrete.

This very interesting book covers in detail all the uses of cement and concrete, among which are: Expressways; Soil-Cement; Concrete for Airports; Reinforced Concrete; Architectural Concrete; Tilt-up; Prestressed Concrete; Concrete for Bridges, Railways, Roofs, Housing and Farms; Concrete Masonry; Concrete Pipe; Asbestos-Cement Products; Cement Grouting; etc.

The section on Concrete Pipe covers Sanitation and Sewage Disposal, Concrete Irrigation Pipe, Solv-

...MEN AT WORK!

Beneath the surface of this undisturbed street in Washington, D. C. men are at work . . . reconditioning water pipelines with the Centriline process. Above ground, traffic flows smoothly . . . unobstructed by the usual men, machinery and excavations. Because the Centriline process centrifugally applies cement-mortar lining to pipes in place, excavation time, overall costs and interruption to street traffic are kept at an absolute minimum. Couple these advantages with the fact that Centrilining permanently prevents corrosion and tuberculation, increases carrying capacity, reduces pumping costs, gives new pipe service at a fraction of the cost of new pipes, and you have the reason why more and more city engineers and officials are specifying Centriline for their pipeline projects.

CEMENT-MORTAR LININGS FOR PIPES IN POSITION

2,298,688 FEET OF EXPERIENCE

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Company

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of United States and Latin America

ON THE WEST COAST, WRITE PIPE LININGS, INC., P. O. BOX 3428, TERMINAL ANNEX, LOS ANGELES, CALIFORNIA

This amazing motor gives you any speed you want—*instantly*—by merely turning a dial. It's light enough to mount on any machine but built to exacting specifications of heavy-duty industrial type Varidrives. There are 24 combinations of speed ranges to choose from in ratios to 10 to 1. With this miracle Varidrive motor you can increase the capacity of your machines, control your speeds for better quality and increased efficiency.

VARIABLE SPEEDS

- 4 TO 10,000 RPM
- RATIOS—10 TO 1
- INSTANT CHANGE
- NEATLY HOUSED
- SMOOTH—QUIET

GET THIS BULLETIN

Mail Coupon . . . gives complete information about various modifications. Upright and horizontal models.

U.S. VARIDRIVE

THE MIRACLE MOTOR

U. S. Electrical Motors Inc.
Los Angeles 54, Calif. (Box 3058)
Milford, Conn. WS-6

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COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

ing Drainage Problems and other uses.

Inflation Hasn't Hit the Water Utility

This piece of telling publicity by the Indianapolis Water Co. reveals to the water customer that his penny will still buy a lot of comfort, performance and safety when it is spent for water supply service.

"Three baths for just a penny"; "Just a penny's worth of water is enough to wash the dishes from six meals"; "One cent's worth of water flushes the toilet seven times on the average" . . . etc., etc.

In these days when the lowly penny will buy little if anything—not even a postage stamp any longer—it must be "news" to the run-of-mine water user that his penny still buys a lot of value when spent for water—water stored for him in the water system, ready for instant use, safe and seemingly inexhaustable.

Why Wait
Until the Well Goes Dry?
It wasn't raining when Noah built the ark.

Since 1885

Patented Discharge Louver

of the GRUENDLER

Sewage Shredder

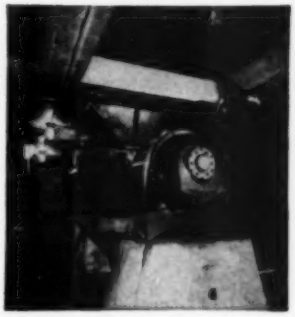
Does It . . .

Q. What is the Discharge Louver?

A. The patented Louver is an ingenious Shredder-Grate Bar installed in the discharge of the unit.

Q. What will it accomplish?

A. Enables the shredder to disintegrate larger quantities or rag stock with ease along with normal run of sewage.



NOW sewage wastes, regardless of rag stock content, can be thoroughly disintegrated for even sewage flow. No clogging . . . less power . . . no costly maintenance.

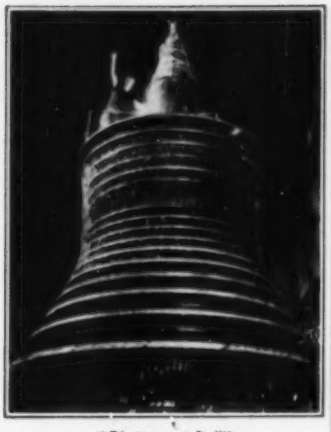
BULLETIN SG-10 and names of Municipalities now operating with the Gruendler Sewage and Garbage Shredders, sent on request.

GRUENDLER

CRUSHER and PULVERIZER CO.

2919 North Market

St. Louis 6, Mo.



"Christmas Bell"

This interesting picture was used on the Christmas card of the News Bureau of General Electric Co. Looking like a huge tinsel bedecked Christmas bell (see man aloft), the picture is actually of a 30 ft. rotor for a steam turbine being built by G-E. The "tinsel" effect is water used as the coolant in the machinery of the turbine.

WHAT IS JASPER'S BIGGEST BARGAIN?

NOW does the cost of your everyday EXPENSES COMPARE with the SAME COST 20 YEARS AGO? Have you ever stopped to compute your present day cost of operating your home, or business with 1932, when we were in the middle of the depression? We did and here is what we found!

ITEM	COST IN 1932	COST IN '52
Water Meter	$8.00 ea.	$22.95 ea.
Copper Pipe	.10 ft.	.40 ft.
¾ Curb Stop	.47 each	$1.76 each
Labor	.25 per hour	.75 (min)
6" C. I. Pipe	.89 ft.	$1.54 ft.
Meter Box	.98 each	$2.64 each
6" Valve	$10.32 each	$49.30 each
Chlorine	.05 lb.	.12 lb.
Alum	$1.22 100 lb. bag	$1.40
Lead	$8.00 100-lb.	$36.00
100 Gallons Water	.05	.05

100 GALLONS of Pure Water Was Then .05c and STILL IS THE SAME PRICE — LETS BE FAIR ABOUT IT

Jasper's Biggest 1952 Bargain

In a newspaper ad the Water and Gas Board of Jasper, Alabama, employed a unique method of impressing upon the water works customer that even in spite of the continually rising prices of everything the water utility had to purchase to operate and maintain the water system, the local

For

WATER, SEWAGE

or

WASTE

treatment

HARDINGE

Double-Acting

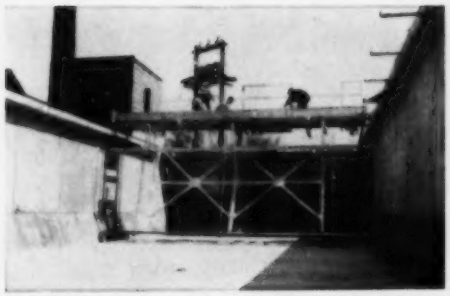
RECTANGULAR CLARIFIERS

Traveling mechanism removes sludge in one direction, scum in either direction

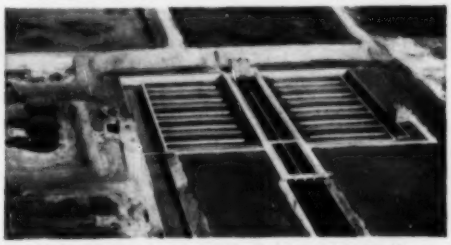
In sewage or water treatment plants where space is limited, or where sludge delivery is desired at one end of the tank, the Hardinge Rectangular Clarifier provides a compact, efficient unit.

A traveling bridge crane spans the tank and supports a sludge scraper. This mechanism moves automatically along the tank scraping all settled solids into sludge hoppers at one end. Skimmers are also available to remove floating impurities from the water's surface.

Write for Bulletin 35-C-15 and give us details of your treatment problem.



WATER SUPPLY—One of two Hardinge 30' x 100' Clarifiers in a Canadian Municipal water plant. Note sludge scraper and scum skimmer.



WASTE WATER—Eleven Hardinge 10.4' x 50.7' Clarifiers removing floating oil and sludge from oil refinery water. Flow: 80,000 G.P.M. of influent.

SEWAGE—Two Hardinge 28' x 80' Rectangular Clarifiers skimming and collecting sludge from sewage water.

WASTE WATER—Largest rectangular clarifier ever built. Mechanism is 78'9" long. Tank is 80' x 255'. Four of these units, plus one 28' x 130' unit are processing oil waste in a refinery.

HARDINGE

COMPANY, INCORPORATED

YORK, PENNSYLVANIA—240 Arch St. Main Office and Works

NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1

122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.

charges for water service had not been increased during the past twenty years. As seen from the accompanying reproduction of the large ad the costs of equipment and supplies have doubled, tripled or even quadrupled in certain instances, whereas the price of water had not been increased from the old 1932 rate of 2.5 cents per barrel of 50 gallons.

Maybe the ad is the forerunner of a rate increase but, if not, then it only proves one of two things—first, that Jasper was charging customers too much in 1932; or second, that it is not charging enough for water service in 1952. Be that as may, the Jasper ad must have impressed the water takers that the Water and Gas Board is bent on remaining anti-inflationary to the last bucket-full.

Excerpts from Purdue's Sanitary Engineering News*

In talking about "Mortality of Water Wells," do they die or just fade away? Herbert Hudson says the average life is only 50 years.

Chicago finds that its rapid sand filters can be operated at 5.0 gallons per sq. ft. and be maintained in service 96.8% of the time.

*Edited by Prof. Don E. Bloodgood.

Fort Wayne has taken bids on a new $6 million water works expansion program. A new raw water intake line will be the first construction.

Linn Enslow in a *Water and Sewage Works* Editorial insists that it is very necessary to have uniformity of state stream pollution control laws [if control at the State level is to remain in favor, and withstand attack by advocates of Federal control]. That portion in brackets we have added.—Ed.

Virulent tubercle bacteria have been found in streams 1.25 miles below the outfall of certain sewers.

Last year one small Texas City paid more than $260,000 in freight charges to haul water in tank cars until a municipal supply which had failed completely could be replaced.

The Aurora, Ill., sewage plant gas engines have earned 377% of their original cost in 177 months of operation.

"Water is one natural resource which can *not* be conserved by abstaining from using it."—Malcolm Pirnie.

An apparatus has been developed at the Chicago Filter Plant that will permit continuous testing for odors in raw and finished water.

The number of water meters read per day in five large cities are as follows:

City	*No. Read*
Milwaukee	165
Detroit	176 to 300
Los Angeles	200 to 350
New Orleans	175 to 200
Cincinnati	126 to 140

Dave Backmeyer (Marion, Ind.) now depreciates the drag-chains on continually operated clarifiers over a nine-year period.

An anaerobic lagoon recently used by a corn canning plant was loaded with 12½ pounds of B.O.D. per 1,000 cubic feet of lagoon with a reduction of 56% in B.O.D. with a detention period of 11.3 days.

Now that fluoridation is so widely considered for public water supplies you should have the A.W.W.A. Bulletins on this topic. This is further encouragement to become a member of the A.W.W.A.

TANK
with a FUTURE
This tank in some respects looks like hundreds of others, but unlike many, it has a brighter future of longer life and greater service, because it is protected by an Electro Rust-Proofing system.
Efficient control of corrosion on submerged surfaces requires much engineering, some equipment. Careful analysis of your problem . . . design, installation and testing by men who are experienced in their work . . . the "know-how" of an established firm . . . "follow through" of every job—on these and similar engineering details rest effective cathodic protection.
Highly trained, backed by a long list of successful installations and years of experience, our engineer is always ready to help you solve your corrosion problem. For complete information, write today.
ERP-21
ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE, NEW JERSEY
Over 15 years of cathodic protection engineering, research and development
COMPLETE CATHODIC PROTECTION SERVICE
DESIGN
ENGINEERING
INSTALLATION
MAINTENANCE
EQUIPMENT

All-Purpose Centrifugal Pump Completely Submersible

601

Kenco, Incorporated, Lorain, Ohio, has announced a new Model P-104 All-Purpose Centrifugal Pump.

The Model P-104 is the most recent design in the Kenco line and features a completely submersible pump, hermetically sealed, that will handle a wide variety of liquids. Other features of the pump include its extremely compact dimensions—height of 7¼ inches and overall width of 5-13/16 inches.

Maximum pump capacity is 1,000 gallons at zero head with a maximum head of 9 feet. Three types of starting arrangements are available, Non-Automatic, Automatic and Manual-Automatic to meet various starting requirements.

C. S. Lawson

J. J. Reynolds

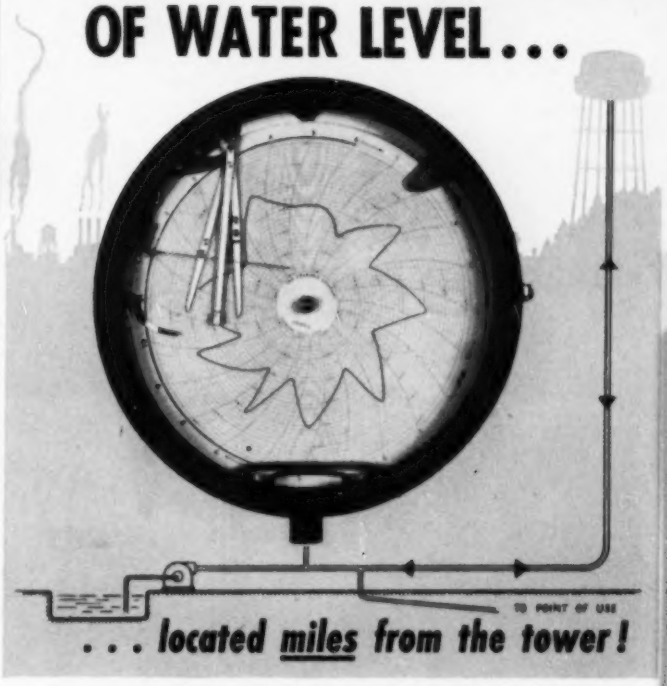
Lawson elected President and Reynolds Vice Pres. U. S. Pipe

President Russell Becomes Board Chairman

United States Pipe & Foundry Company, Burlington, N.J., has announced the election of Claude S. Lawson as president and chief executive officer of the company and James J. Reynolds as vice president.

Mr. Lawson has been president of Sloss-Sheffield Steel & Iron Company since 1948, which company he joined in 1915 as a chemist upon graduation from Clemson College. He became successively blast furnace superintendent, general superintendent, gen-

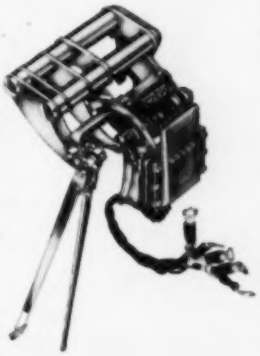
"WIRELESS" CONTROL OF WATER LEVEL...



. . . located miles from the tower!

You save the cost of wiring between tower and station with Foxboro Recording Rotax Control of elevated storage level. All measurements are made right at the pump! What's more, Rotax Controllers cost less to install and maintain, are easier to adjust than pressure switches, provide a record of operation, and the entire installation is located at the pumping station.

The operating principle of this system is that changes in line pressure at the pump indicate corresponding changes of water level in the remote tower. By continuous measurement of this pressure, Foxboro Control automatically starts and stops the pumps to maintain tower tank level within pre-set limits. Data Sheet 831-7 gives full details and drawings. Write for it! **The Foxboro Company, 896 Neponset Ave., Foxboro, Mass., U.S.A.**



This exclusive Rotax assembly assures positive, unfailing pump operation. Its proven design overcomes disadvantages of ordinary electric controls. Maintenance is virtually eliminated.

FOXBORO
REG. U.S. PAT. OFF.
RECORDING · CONTROLLING · INDICATING
INSTRUMENTS

eral manager, vice president, president and director.

Mr. Reynolds has been assistant to the chairman of the board since January 1, 1952, after having served as a member of the National Labor Relations board for a period of 5½ years.

Hahn Elected Executive Vice President of Welsbach

Welsbach Corporation, Philadelphia, Pa., has announced the election of Victor A. Hahn to a newly created position of Executive Vice-President of the corporation and to membership on the Board of Directors. As a member of the Board, Mr. Hahn will succeed Richardson King Wood of New York whose resignation was regretfully accepted.

Mr. Hahn, according to Morse DellPlain, President, is one of the world's leading authorities on ozone generation. As Director of the Ozone Processes Division of the corporation, Mr. Hahn has been working closely with Emery Industries, Inc., of Cincinnati on plans for the largest industrial ozone installation in the world. The ozone installation for water purification at the Belmont filtration plant in Philadelphia, previously the world's biggest, was built under Mr. Hahn's direction.

M&H

CHECK VALVES

Cutaway view above shows how disc is mounted on clapper arm. Disc facing is bronze or rubber. Seats are bronze. M & H Check Valves may be installed in horizontal or vertical position. Disc swings entirely clear of waterway and will not stick in open position. Two bosses on each side may be tapped for bypasses and two bosses on bottom may be tapped for draining.

Furnished with flanged, screwed, hub, mechanical joint or Universal end connections. Flanged check valves can be furnished with outside lever and weight or outside lever and spring. Both the weight or the spring are adjustable for positive and easy opening and closing, and to minimize slamming and banging of the disc.

Underwriters and Associated Factory Mutuals listed and approved. Complete information on request. Write or wire M & H Valve and Fittings Company, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

Vacuum Deaerator

602

Permutit Company, New York, N.Y., has just marketed a new Vacuum Deaerator.

In operation, water is sprayed into the deaerator shell maintained under a vacuum or at an absolute pressure approximating the boiling point. The entering water is distributed over the top surface of a stack of trays or other packing such as Raschig rings. This packing sub-divides the water particles repeatedly to expose new water surfaces to the gaseous phase. The non-condensable gases and water vapor are then drawn upwards through the packing and removed by vacuum pumps or steam ejectors.

Chain Belt Occupies New Administration Building

Chain Belt Company, Milwaukee, Wis., is now occupying its new administration building, located at 4701 W. Greenfield Avenue, Milwaukee, Wisconsin. For the past 50 years, the firm had its executive headquarters at 1600 W. Bruce Street, Milwaukee.

The new building, of brick, stainless steel and glass construction, is directly adjacent to its Milwaukee man-

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

ufacturing facilities, and houses the offices and departments of General Administration, Field Sales Administration, Sales Promotion and Advertising, Purchasing, Accounting, Statistical, Tax, Cost and Casting Sales.

Graver Tank Elects Sulcer Vice-President

Graver Tank & Mfg. Co., Inc., East Chicago, Ind., has announced the election of Henry T. Sulcer, formerly General Manager of the Graver Water Conditioning Co., New York, as Vice-President of the parent Company.

Mr. Sulcer has directed the activities of Graver Water Conditioning Co. since its establishment in separate headquarters in New York. He had served earlier as general auditor for all divisions of Graver. Previously, he has been vice-president and general manager of a Chicago manufacturer of industrial heating equipment.

Automatic Signaller Indicates End of Zeolite Softner Run

603

Refinite Corporation, Omaha, Nebraska, has developed a true method of signalling the end of a zeolite softener run. Called the "Hydramizer," the device takes a sample of the water periodically and makes a soap test for hardness. If the water is hard a red light appears. If it is still soft a green light glows. For automatic softeners, it will actuate the automatic valves, and for selective automatic or manual units it will ring a bell to warn the operator that regeneration is necessary.

The Hydramizer does not depend on the water being hard simply because a certain number of gallons has passed through the softener. Neither does it depend on soap curds to break the beam of a photo electric cell. The soap container must be filled occasionally, but other than that no routine maintenance is necessary. The unit is also equipped with a window so that

For the City of Jacksonville...

New McDuff Pumping Station, Constructed by Henry G. DuPree Co.

IT'S 100% SIMPLEX

TYPE MO VENTURI METERS

The City of Jacksonville, Florida installed its first Simplex Type MO Venturi Meters back in 1925. Here's what Mr. C. H. Helwick, Superintendent of Jacksonville's Water Department, has to say about those original meters:

"These two meters have required very little attention and have remained dependably accurate through the years. The capacities of the pumping stations . . . have been enlarged beyond the capacities of the meters, and these meters have been removed and reinstalled at new pumping stations for more years of service."

No wonder, then, when consulting engineers Reynolds, Smith & Hills undertook the plans for Jacksonville's $7,000,000 water works improvement program, that Simplex Type MO Venturi Meters were specified as standard equipment for *all* pumping stations. For full information about MO and other Simplex meters write to Simplex Valve and Meter Company, Department 6, 6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY

the operation can be checked at a glance.

Farlow to Manage Baltimore Office for Sterling

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the appointment of E. Stephen Farlow as Manager of the new Baltimore Sales Office.

The Baltimore territory was formerly served by the Philadelphia office. The Philadelphia office will still exercise administrative direction over the new office.

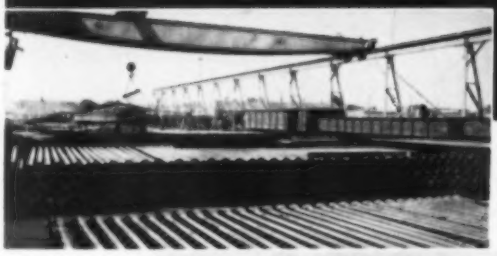
H. A. DesMarais Named General Sales Manager of Pennsalt of Washington

Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has announced that Hubert A. DesMarais has been appointed general sales manager of the Pennsylvania Salt Manufacturing Company of Washington.

Mr. DesMarais, formerly Pacific Coast Sales Manager for the General Dyestuff Corporation with headquarters in San Francisco, will locate at Pennsalt of Washington's central office in Tacoma.

Well known in chemical and industrial fields in the West, Mr. DesMarais came to Portland, Oregon, in 1932 to open and manage the first General Dyestuff Corp. office there. In 1937 he was appointed Pacific Coast Manager. Previously he had been technical and sales representative on dyestuffs and chemicals for the paper board and pulp mills in New England.

Prompt Shipment CAST IRON PIPE



Pipe Foundry Shipping Yards at McWane Cast Iron Pipe Co., Birmingham, Ala.

Shipping Yards Pacific States Cast Iron Pipe Co., Provo, Utah.

IF YOU'RE IN A HURRY, PHONE

McWANE-PACIFIC

Prompt, quick shipment by rail or truck now is available from our stock yards of McWane-Pacific DeLavaud Centrifugal Cast Iron Pipe in sizes 4" and larger, 18' lengths.

Furnished either tar coated or cement lined and you may have your choice of open-bell Bell-and-Spigot, precalked Bell-and-Spigot, or Mechanical Joint. The Federal Government has recently placed Cast Iron pressure pipe and fittings under building materials category and your former 45-day limitation on pipe inventory has been changed to allow inventory based on practical working requirements. For quick shipment, telegraph or telephone our nearest Sales Office.

McWANE Cast Iron Pipe Company
Birmingham, Ala.
Pipe Sizes 2" thru 12"

Sales Offices

Birmingham 2, Ala.	P. O. Box 2601
Chicago 1, Ill.	333 North Michigan Ave.
New York 4, N. Y.	80 Broad Street
Kansas City 6, Mo.	1006 Grand Avenue
Dallas, Texas	1501 Mercantile Bk. Bldg.

PACIFIC STATES Cast Iron Pipe Co.
Provo, Utah
Pipe Sizes 2" thru 24"

Sales Offices

Provo, Utah	P. O. Box 18
Denver 2, Colo.	1921 Blake Street
Los Angeles 48, Cal.	6399 Wilshire Blvd.
San Francisco 4, Cal.	235 Montgomery St.
Portland 4, Oreg.	501 Portland Trust Bldg.
Salt Lake City	Waterworks Equip't Co.

Cyclothene Plastic Piping

604

Munray Products, Inc., Cleveland, Ohio, has announced the manufacture of Cyclothene Pipe. This pipe is tough, durable, semiflexible and is highly resistant to a wide variety of solvents and is unaffected by mineral acids, salts and alkalies at temperatures up to 150°F. It is also unaffected by temperatures as low as -50°F and retains all its properties through repeated freezing and thawing. It is completely free from electrolytic corrosion.

Made in all sizes ¼ to 6 inches, Cyclothene Pipe is furnished in stock lengths of 25 ft. in 4 inch or larger pipe, 150 ft. coils for 3 inch pipe, 250 ft. coils for 2 inch pipe and up to 400 ft. in smaller sizes.

The pipe is readily connected with knurled and insert connectors clamped with stainless steel bands. A standard pipe thread adapter is also available where connection to other equipment is desired. Cyclothene can be furnished with welded-on flanges in specific lengths. Ells, tees, and Ys can be fabricated, as needed.

Lindsey Appointed Branch Manager for Byron Jackson

Byron Jackson Co., Los Angeles, Calif., has announced the appointment

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

of E. L. "Ed" Lindsey as Los Angeles Branch Manager for the Pump Division.

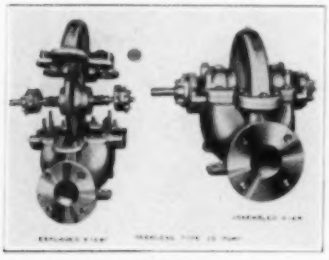
Mr. Lindsay graduated from the University of Oklahoma in 1942. He took an additional two-year course at the Spartan School of aeronautics at Tulsa, Oklahoma, and became affiliated with Byron Jackson Co., in 1944, with the position of Sales Engineer at the Houston (Tex.) Branch of the company.

McIntosh Appointed Western Rep. for Dresser Mfg.

Dresser Manufacturing Division, Dresser Industries, Inc., Bradford, Pa., has announced the appointment of Russell W. McIntosh as Corrosion Products Representative for the Western and Pacific Coast District.

According to H. Z. Hight, Sales Manager of the Division, Mr. McIntosh has wide experience in the corrosion field, having been with Koppers Company for 2 and one-half years in the Tar Products Division. He also was with the Pittsburgh Coke and Chemical Company as West Coast Manager of the Protective Coating Division.

Originally from Portland, Oregon, where he attended Benson College, Mr. McIntosh moved to Los Angeles, Calif., and completed a course in industrial engineering at the University of Southern California.



Horizontal, Split-Case General Service Pumps

605

Peerless Pump Division, Food Machinery & Chemical Corp., Los Angeles, Calif., has announced a new line of horizontal split-case, general serv-

SARAN LINED steel pipe

Cut "downtime" to a minimum! Saran lined steel pipe can be cut and threaded in the field as easily and quickly as ordinary steel pipe—involving no costly delays with special tools or handling. And, once installed, saran lined steel pipe means dependable long term operation. In addition to excellent corrosion resistance, this remarkable pipe offers you the plus values of rigidity and pressure strength.

These advantages are of prime importance to you in the reduction of shut-down time and equipment replacement. INVESTIGATE saran lined steel pipe today! Mail this coupon for full information. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

Distributed by

Saran Lined Pipe Company

2415 BURDETTE AVE. • FERNDALE, MICHIGAN
With Offices in: New York • Boston • Philadelphia Pittsburgh • Chicago • Tulsa • Portland • Indianapolis San Francisco • Houston • Denver • Seattle • Los Angeles • Cleveland • Charleston, S. C. • Toronto

send today!

Please send me your catalogue containing detailed information on Saran Lined Pipe, Valves and Fittings.

NAME_____

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COMPANY_____

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CITY_____

STATE_____

SP-93A

SARAN LINED PIPE
DOW
product

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

ice pumps featuring the use of standard mechanical shaft seals instead of conventional stuffing boxes.

This line of pumps, designated as the Peerless Type AS, is available in discharge sizes from 1½ through 4 inches. Capacity range is up to 750 gpm and head range is up to 230 feet.

By use of standard mechanical shaft seals, instead of conventional stuffing boxes, the manufacturer states that the pump shaft of the Type AS pump is shortened to ½ the length of shafts in conventional pumps of the same size. As a result, the Type AS shaft is more rigid and shaft deflection is materially reduced.

Smith Joins Neptune as Middle-Atlantic Rep.

Neptune Meter Company, New York, N.Y., has announced that Mr. Stuart Smith, Jr., of Richmond, Virginia, has joined its sales force and will be assisting Mr. M. J. Siebert in the sale of water meters in the States of Virginia, Maryland and West Virginia.

Prior to coming with Neptune, he was associated with James Lees & Sons, Glasgow, Va., and Charles W. Barger & Sons, Lexington, Va.

Rockwell Appoints Proske Service Manager

Rockwell Manufacturing Company, Pittsburgh, Pa., has announced the appointment of H. O. Proske as Service Manager of the Company. He will be headquartered in Pittsburgh, and his duties will consist of establishing product repair and parts handling procedures in factories and warehouses.

Mr. Proske studied engineering at Washington University in St. Louis, Missouri, and in 1928 he joined the City of St. Louis Water Department as a Pitometer Engineer. He was later affiliated with the U. S. Government as a Rainfall and Drainage Engineer, and with the Homelite Corporation as a Sales Engineer. Mr. Proske joined Rockwell in 1937 as a Sales Engineer in the Kansas City area, a position he held until his recent promotion.

R. L. Hedges will replace Mr. Proske in the Kansas City territory. His background with Rockwell includes service man, sales engineer and warehouse manager.

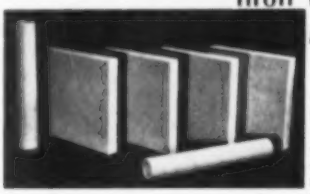
New Valve Series

606

Glauber Brass, Inc., Kinsman, Ohio, has announced the production of a complete new valve line in both iron pipe and copper to copper stops and stop and waste patterns.

(Continued on page 119A)

FILTROS HIGH PERMEABILITY AIR DIFFUSER PLATES



The trend to the use of higher permeability plates (40 to 80 perm.) throughout the Activated Sludge Process Field, finds FILTROS again in the forefront. The same qualities which have made FILTROS famous in the low permeability field are now available in these higher ratings as well. FILTROS round grain construction is a big factor in the long years of service these plates are giving in many outstanding plants throughout the country, such as:

Milwaukee, Wisc., (25 yrs.) — **Hagerstown, Md., (19 yrs.)**
Peoria, Ill., (20 yrs.) — **Phoenix, Ariz., (14 yrs.)**
Chicago North Side, (22 yrs.) — **Mamaroneck, N.Y. (23 yrs.)**

FILTROS long experience as America's pioneers in the manufacture of porous ceramic diffuser plates is at your service, and FILTROS engineers offer personal attention to your problems—whether you are planning new installations, or are having difficulties with your present system. Write for further information, literature, today. (Porous filter bottoms for water filtration and other uses are also available.)

FILTROS, INC.

602 W. Commercial St. — **East Rochester, New York**

Serving the Activated Sludge Process Field with Porous Ceramic Air Diffusers since 1917

You can't afford to miss it!

Water & Sewage Works

A magazine which specializes in water supply, sewage disposal and industrial waste, to help you solve your problems.

Read by over 735 Consulting Engineers who specialize in this field—a significant testimony to the quality and reliability of the publication.

If not a subscriber—place your order NOW and be sure of a copy of the new revised REFERENCE AND DATA NUMBER. Fill in coupon, and mail today to

WATER AND SEWAGE WORKS
22 W. MAPLE ST. CHICAGO, ILL.

☐ 1 yr. $2.00 ☐ 2 yrs. $3.00

Name

Title and Dept. or Firm

Street Address Zone

City State

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

READER SERVICE CARDS for

WATER & SEWAGE WORKS

Equipment — Products
Information — Literature

JUST
CLIP
THESE
CARDS
MARK
AND
MAIL —
TO
RECEIVE
THE
LATEST
INFORMATION
OR
LITERATURE
DESCRIBED
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WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Reader Service

Place Stamp Here

WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Reader Service

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

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WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

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WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

(Continued from page 118A)

Identified as the "900" series, this new design is streamlined for lighter weight without sacrificing quality standards or operating specifications. Full waterways are used throughout and a tapered seat gives greater bearing surface insuring positive shut-off and long trouble-free service life. Sizes from ½ through 1 inch are available in all patterns.

Versatile "Three-Way" Laboratory Stirrer

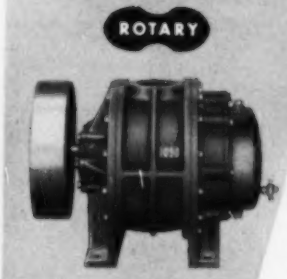
607

Fisher Scientific Co., Pittsburgh, Pa., has developed a Versatile Stirrer for a very wide application in the laboratory, doing what formerly required at least three different stirrers. Its three shafts, two of which are geared to the third—or rotor—shaft, provide maximum speeds of 140, 825 and 5,000 r.p.m., respectively, and can be regulated to any intermediate r.p.m. from "off" to maximum by the rheostat.

It is simple to use any one of the three shafts, or to change from one to another. A clutch-type clamp makes it easy to swing from one position to another simply by turning a large wing bolt. The stirring rod, which has an eight-inch shaft, is quickly put in position and firmly held by a nickel-plated holder or "chuck." This chuck will accommodate any rod up to 5/16" diameter, and any special-shaped stirring rod can be quickly inserted in place of the universal type provided with the apparatus.

The base has been designed to hold the rheostat box out of the way, toward the rear. However, the rheostat, which is simply set in this recess, can be lifted out and placed in any convenient area near the apparatus. The enclosed motor can be used on both direct and alternating currents.

For 10 CFM or 100,000 CFM ...compare blower values



Typical low-capacity R-C Rotary Positive Blower. Sizes range from 5 cfm to 50,000 cfm, permitting selection closely matched to needs.

- ☐ Choice of Rotary or Centrifugal
- ☐ Capacity matched to the job
- ☐ Easy accessibility
- ☐ Ruggedness
- ☐ Ease of installation
- ☐ Ability to handle overloads
- ☐ Long-time durability
- ☐ Freedom from breakdowns
- ☐ Low maintenance costs
- ☐ Engineering assistance
- ☐ Proved reputation of maker
- ☐ Customer satisfaction

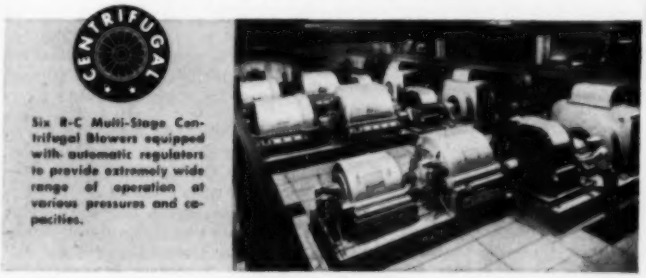
No need to take chances when buying blowers, exhausters or gas pumps. Just put this "detector test" to work on your specific problem and you'll arrive at the most satisfactory answer.

For instance, if you're debating between Rotary Positives and Centrifugals, remember that only Roots-Connersville builds both—the exclusive *dual-ability line* that permits unbiased recommendations. Their wide range of capacities supplies sizes and types that are quite likely to be most closely matched to your needs.

For economy of operation, reliability and low maintenance, we refer you to a list of users that dates back almost a century. If you'll rate your possible choices on a performance basis, you'll usually find R-C equipment "tops" on the list.

To help you make the most profitable, practical decision, our experience is at your service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
525 Mount Avenue, Connersville, Indiana



Six R-C Multi-Stage Centrifugal Blowers equipped with automatic regulators to provide extremely wide range of operation at various pressures and capacities.

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Snook Appointed Sales Vice Pres. of Atlas Mineral

Atlas Mineral Products Co., Mertztown, Pennsylvania, has announced the appointment of Joseph A. Snook to Vice President in Charge of Sales for the Company.

Mr. Snook, associated with the Company since 1942, served as secretary and purchasing agent prior to this appointment. He is a graduate of Pennsylvania State College.

Lockwood Made Vice Pres. of American Brass

American Brass Company, Waterbury, Conn., has announced the appointment of Justice Lockwood, formerly Manager of the Buffalo, N.Y., Branch, to Vice President in Charge of Sales for the entire company.

Mr. Lockwood's headquarters will be at the main office of the company in Waterbury. No successor to Mr. Lockwood has been named yet, and no further changes are involved in the company's sales organization at this time, according to Arthur H. Quigley, American Brass Company Board Chairman.

What chlorine's dual personality means to you...

Perhaps you have wondered why chlorine can be shipped in steel containers yet requires equipment of highly specialized construction materials for in-plant handling and feeding. This is explained by chlorine's dual personality.

Dry chlorine, either liquid or gaseous, is inert and as such can be handled safely with ordinary materials—steel cylinders, copper tubing, etc. *Moist* chlorine, this same inert material combined with water vapor, suffers a complete "personality" change. Moist chlorine is highly corrosive. It attacks many of the more commonly used materials of construction, such as steel, copper, iron, etc. Even trace amounts of chlorine vapor in the air, because they are moist chlorine vapors, will attack and corrode instruments and equipment much the same as salt air attacks a steel casement window at a seashore residence.

Equipment for handling moist chlorine gas definitely requires special materials of construction. Rubber, glass, and Tantulum are totally unaffected by moist chlorine. Silver and Hastelloy "C" are highly resistant but are none-the-less affected by this corrosive mixture.

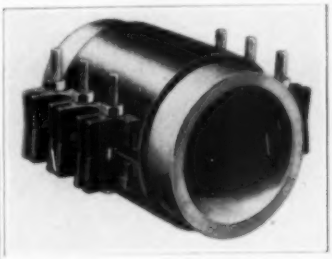
Builders Chlorinizers have been designed to take advantage of the dual personality of chlorine.

These solution-type chlorine gas feeders meter and control chlorine gas in the same *dry, non-corrosive state* as it comes from the steel container. This fact alone accounts, in large part, for the long-lived, dependable performance of these chlorine gas feeders. Secondly, Builders Chlorinizers utilize materials which are either completely or highly resistant to the corrosive action of moist chlorine gas. The chlorine control valve has a Tantulum diaphragm, a silver valve seat and Hastelloy "C" valve needle, and is lined throughout with a vitreous enamel lining. When you consider that the vital control and metering elements of Builders Chlorinizers are also isolated from any moisture by special drying filters, you can appreciate the care we have taken to prevent moisture from reaching costly precision parts.

Builders Chlorinizers also are built to prevent the generation of moist chlorine vapors. The water used to seal the vacuum bell jar is continually drawn off into the injection line and delivered to the point of application. This water is in turn replaced by fresh supply water, with the result that the tray water is not allowed to become "ripe", thus eliminating the one big source of odorous, corrosive chlorine vapors in the operating room.

If you would like to find out firsthand how Builders Chlorinizers tame that yellow demon, that Dr. Jekyll and Mr. Hyde, CHLORINE GAS — write for the name of the nearest Chlorinizer installation in your vicinity. See for yourself why the swing is to Chlorinizer. We'll also be glad to send you descriptive Bulletins and complete information. Builders-Providence, Inc. (Division of Builders Iron Foundry), 350 Harris Ave., Providence 1, R. I.

BUILDERS-PROVIDENCE



Fully Cushioned Wrap-Around Pipe Clamp

608

R. H. Baker & Co., Huntington Park, Calif., has announced a new pipe clamp which provides a fully cushioned wrap-around to make fast, permanent pipeline repairs.

The Baker CirclSeal Clamp repairs full breaks quickly in steel, cast iron and asbestos-cement pipelines. A specially compounded gasket assures a complete seal even on out-of-round and damaged pipe. No shutdown for repairs is needed, and it can be installed in wet ditches without draining and filling of the line.

Hennessy Joins Builders-Pacific

Builders-Pacific, Inc., Berkeley, Calif., has announced the appointment of Paul V. Hennessy as Sales Manager of the Southern Branch of the company at 5259½ Beverly Blvd., Los Angeles.

Mr. Hennessy is a graduate of the University of Southern California with a degree in Civil Engineering. During World War II he served as a Lt. Comdr. in the U. S. Navy. Prior to his association with Builders-Pacific, he was a sales engineer for Armco Drainage and Metal Products Co. in Los Angeles.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Polyvinyl Chloride Pipe Tape by Dresser

609

Dresser Manufacturing Division, Dresser Industries, Inc., Bradford, Pa., has announced Dressertape, a new polyvinyl chloride pipe tape.

According to the company this tape is the result of several years testing of pipe protection materials by Dresser Laboratories. It is said to possess exceptional dielectric and insulation properties. The 10 mil Dressertape has an insulation resistance of 100,000 megohms and dielectric strength of 10,000 volts.

Dressertape has high adhesive firmness, extra strength, sunlight resistance and excellent aging qualities. It provides effective protection against water, salt water, acids, alkalies, oil and soil chemicals.

The new tape is claimed to conform readily to irregular surfaces making it especially adaptable for the protection of fittings on service lines.

G-E's Electric Sink and Cabinet Dep't Moves South

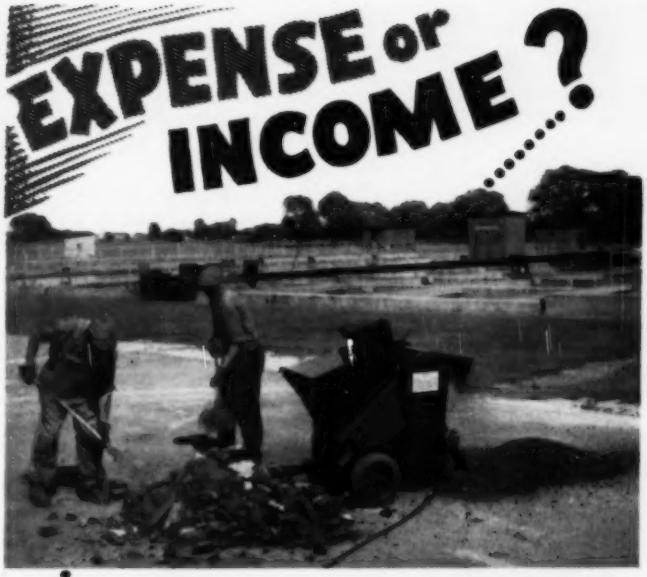
General Electric, Bridgeport, Conn., has announced that headquarters for the electric sink and cabinet department has been moved to Louisville, Ky.

This department, which manufactures household garbage grinding units, will be the third of the major appliance division's five product departments to set up headquarters at Louisville where the company is building an "Appliance Park." The manufacture of major appliances will continue at existing plants throughout the country until production facilities become available at Appliance Park.

Permutit Appoints Blundon

Permutit Company, New York, N.Y., has announced the appointment of Mr. M. Blundon as District Engineer of its Decatur, Illinois Office.

In his new position, Blundon will take over the duties formerly performed by Mr. R. B. Bruns, who has



...the difference is a ROYER

Whether your sludge disposal operation is an expense or a source of income depends on whether or not you process the sludge for sale. With a Royer Sludge Disintegrator, cake right from the beds is shovelled into the hopper, commercial fertilizer added if desired, and a completely shredded, pulverized and aerated ready-to-use product is discharged. Sludge cake with moisture content as high as 56% can be handled . . . all twigs, stones and trash are removed.

There is a ready demand for this rich plant food among florists and nurserymen, parks and golf courses. Investigate this easy method of turning an expense into an income. Write for a copy of our Sewage Sludge Datalog which gives all the facts.

• The 5 to 8 cu. yd. capacity model shown above is operated by the Onondaga Public Works Commission, Syracuse, N.Y.

ROYER — PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST. KINGSTON, PA.

STOP
JOINT
LEAKAGE
USE
CARSON CLAMPS
With Pearlitic C.I. Bolts for Cast Iron Pipe and Fittings.
Write for Prices.
H. Y. CARSON
1221 PINSON ST. BIRMINGHAM, ALA.

Servicing Water Holders All Types Elevated and Standpipes. Specially designed materials that hold down corrosion.

IT'S THE APPLICATION THAT COUNTS
All guaranteed work.

SPEELMON ELEVATED TANK SERVICE
Complete Painting & Repair Service
822 N. Court St. Rockford, Ill.

been transferred to the Philadelphia, Pa., sales office.

Diaphragm Box Simplifies Pump Well Level Control

610

Foxboro Company, Foxboro, Mass., has announced the Foxboro Rotax Level Controller using a diaphragm box measuring element.

This system permits location of the instrument at a distance from the well, thus avoiding the necessity for explosion-proof construction. Changes in the pump well level produce corresponding air pressure changes within the diaphragm box, the tubing and the controller. When any such change reaches the pre-set high or low level limit, the controller's Rotax assembly makes or breaks contacts to start or stop the pump motors in any desired sequence.

Patterson Appointed Branch Manager for American Brass

American Brass Company, New York, N.Y., has announced the appointment of Scott H. Patterson as branch manager of the company's Buffalo, N.Y., plant. Since 1950, Mr. Patterson has been New York City district sales manager, with offices at 25 Broadway.

Mr. Patterson was educated in Buffalo and joined the Buffalo Branch of American Brass in 1927. He was transferred to the company's Pittsburgh office in 1935, and appointed district sales manager there in 1939. Mr. Patterson will take over the duties of Justice Lockwood, who was recently appointed vice president in charge of sales for the entire company.

when you use RUBBER HYDRORINGS you always save MONEY in water line construction

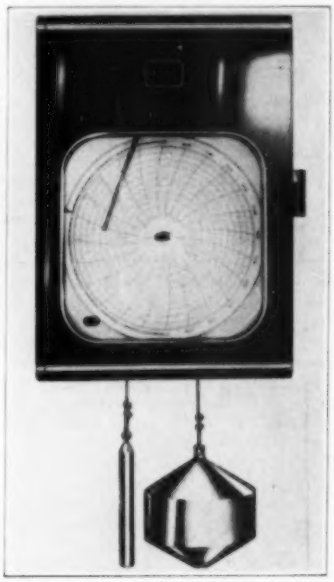
Write for Bulletin M10-5

Time and labor, the BIG cost factors, are reduced with HYDRORINGS. Workmanship requirements are held to a minimum, and good cast iron pipe jointing becomes a fast, systematized routine.

Money is also saved because HYDRORINGS are permanent. They are solid, and do not deteriorate in regular use.

In maintenance, HYDRORINGS provide even greater economy. Since rubber does not harbor or support growth of bacteria, only the initial hypochlorite flush is needed. Elimination of repeated treatments means large savings that carry on through all the years of service.

ATLAS MINERAL
MERTZTOWN, PENNSYLVANIA
HOUSTON, TEXAS



Open Channel Flow Meters

611

Bristol Company, Waterbury, Conn., has announced a new line of Series 500 Open Channel Flow Meters for measuring, recording, and controlling the flow of water, sewage, industrial plant effluent, etc.

The new meters supercede the Model 4-M line formerly manufactured by the company. The flow is determined by measuring the head of liquid flowing through a flume or over a weir in the flow channel. This measurement of head is interpreted by means of a cam, cut to the equation of the weir or flume, into terms of flow, which is then recorded on a uniform chart and integrated if desired.

Two general types are offered. In the mechanical type, the cam mechanically moves the pen arm across the chart. The electric type employs the Bristol timed-impulse type of remote recording. This is similar to the Metameter Telemeter, except that the cam is cut to the curve of the weir or flume involved. With this type, the record

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

can be made at any distance from the point of measurement.

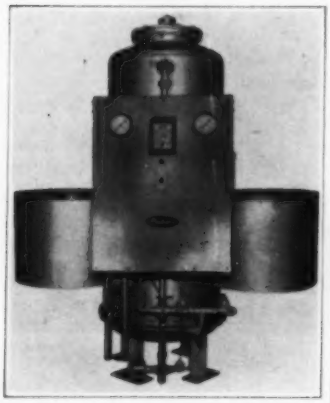
Cams can be cut to provide uniform charts for any of the various weir plates in general use, such as V-notch, trapezoidal, Cipoletti, or rectangular.

Baumgartner Joins Neptune Meter

Neptune Meter Company, New York, N.Y., announced that Mr. James L. Baumgartner has joined its sales force and will represent the company in the sale of meters in and around Houston, Texas.

Prior to coming with Neptune, he was associated with General Foods, Kellogg Sales Company and Flato's Company.

Mr. Baumgartner replaces Gus Matthews who has been recalled to active duty with the Marine Corps.



Mono-Bed Demineralizer Features Automatic Advantages

612

Penfield Manufacturing Co., Meriden, Conn., has announced the addition of a new fully automatic Mono-Bed Unit to its demineralizing equipment line.

The new Demineralizer performs all its operating functions, including the regeneration cycle, completely automatically. There are no valves to

If your SERVICE MAN had 5 hands

He might keep up with the workman who changes meters in Ford Yokes

The permanently rigid setting provided by a Ford Yoke makes installation or exchange of meters so simple that it is no exaggeration whatever to say that you save half on labor time. Ford Yokes and other types of setting devices meet every water line condition, indoors or outdoors. Send for complete Ford catalog that describes the entire Ford line.

THE FORD METER BOX COMPANY, INC.
FOR BETTER WATER SERVICES
FORD
Wabash, Indiana

HYDRO-TITE
DEPENDABLE JOINTING COMPOUND
Seals Bell and Spigot Water Mains
Economical—Effective
Over 35 Years Of Dependable Performance

HYDRAULIC DEVELOPMENT CORP.
MAIN SALES OFFICE 50 CHURCH ST., N. Y. C.
General offices and works W. Medford Sta., Boston, Mass.

operate and no supervision is required. Whenever the effluent's conductivity falls below standard, the treated water is automatically discharged and lights signal the need for activation of a regeneration cycle.

The simple turning of a single switch then puts the unit through its regeneration cycle completely automatically, including rinsing and recutting in the effluent when desired resistivity is reached. During this automatic regeneration cycle, the regenerative tanks are automatically refilled with water so that fresh acid and caustics may be added in preparation for the next regeneration cycle.

The unit is available in flow rates from a few gallons per hour to 5,000 gallons per hour and up.

New Plastic Case for Midget Pool Water Tester

613

W. A. Taylor & Company, Baltimore, Md., has introduced a small, modern, cleverly designed molded plastic case to contain its Midget Kit for testing swimming pool water for pH and chlorine.

The entire case is scarcely larger than an indoor baseball, and is equipped with a molded-in, hinged cover and snap fastener. It is impervious to moisture and corrosive liquids.

Sterling Electric Motors Opens Denver Office

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the opening of a new District office at 1726 Champa St., Denver, Colorado. Mr. James R. Hughes has been appointed District Manager of the new office.

Mr. Hughes has had many years of diversified experience as an application engineer for electric power drives. The new Denver Office will service the industrial, commercial and agricultural requirements for electric power drives in Colorado, New Mexico and part of Wyoming, Nebraska and Texas.

Chain Belt Appoints New Distributors

Chain Belt Company, Milwaukee, Wis., has announced the appointment of the following distributors for products of the Chain and Transmission Division, Baldwin-Duckworth and Conveyor and Process Equipment Divisions of the company.

Donald Corporation, 308 6th Avenue East, Des Moines, Iowa.

Potts Brothers Transmission and Equipment Company, Cloverdale, California.

R. P. Johnson, 355-365 East Main Street, Wytheville, Virginia.

The Bearing House, 1252 N. Ventura Avenue, Ventura, Calif.

Heald Mill Supply, Inc., 32 Winthrop Street, Augusta, Maine.

Harmer Mill & Logging Supply Company, 209 Polk Street, Eugene, Oregon.

Chlorine Tablets

614

Gliss'n Products Co., Inc., Chicago, Ill., have recently introduced "Chlorets" for use in various types of water treatment and quality control problems. These concentrated tablets release over 68% available

"I NEVER CONNECT IN THE WRONG HOLE- with FLEXICROME SEWER-ROD COUPLINGS!"

Pats. 2,110,202 2,471,060

Greatest Improvement Since the Coupling Itself!

This improved coupling for HIGH SPEED POWER TURNING MACHINES never assembles in the wrong (lock pin) hole, making it necessary to uncouple to use a lock pin. Saves time and money. CLICK, SNAP — IT'S HOME. "FLEXICROME" ROD —made exclusively for Flexible — is used exclusively. They are interchangeable with all "OLD STYLE" Flexible Rods.

"OLD STYLE" Rods and Couplings can still be furnished to cities that still turn their rods by hand (the slow, expensive way). Expect as good results as you had 15 YEARS AGO.

Just move coupling in or out of the ratchet or power drive shaft—pressing pin down till it clicks. Then turn right or left for hole.

WRITE today

"FLEXIBLE"

SEWER-ROD EQUIPMENT CO.

9035 VENICE BOULEVARD, LOS ANGELES 34, CALIF.

41 Greenway St. — Hamden 14, Conn.
147 Hillside Terrace — Irvington, N. J.
P. O. Box 485 — Memphis, Tennessee
1115 Delaware Ave. — Fort Pierce, Fla.
141 W. Jackson Blvd. — Chicago, Ill.
200 Magee Bldg. — Pittsburgh, Penn.
66 Kinley Drive — Rochester 9, New York
29 Cordan Avenue — Roslindale 31, Mass.
801 E. Excelsior Blvd. — Hopkins, Minn.
3786 Durango St. — Los Angeles 34, Calif.
4455 S. E. 24th Street — Portland, Oregon
Francis Hankin — Montreal & Toronto, Can.
351 West Jefferson Blvd. — Dallas, Texas

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

chlorine and because of their density are stable enough to withstand storage for periods of at least a year in closed containers.

"Chlorets" are compounded to dissolve slowly over periods of from 1 to 9 hours depending upon the temperature of the water treated and the amount of agitation present. During this time each tablet releases 0.007 lbs of chlorine. Because of their weight "Chlorets" are especially suited to the treatment of tanks; water tunnels, mains opened for local repairs, piping systems, new wells and for algae control in small pools.

Present packaging is in cases of 1 dozen 1 pound sealed jars containing 94 large chlorets each and in 25 and 100 lb. drums.

Kenco Establishes Service Centers for Pump Owners

Kenco, Inc., Lorain, Ohio, has announced the establishment of field service centers. Submersible pumps require hermetically sealed motors and these motors are serviced only by the factory or by factory-operated service centers. According to the company, this is part of a program to train, franchise and establish local centers to fulfill customer needs and provide skilled service for pump owners.

Fifteen key service centers have been established throughout the eastern half of the U. S., with plans for more. These centers are equipped with the special test panel and tools for prompt, efficient servicing and are staffed with key service men who have received intense training at the Kenco factory.

Literature & Catalogs

Plating Room Controls For Pollution Abatement

615

The Metal-Finishing Industry Action Committee of the Ohio River Valley Water Sanitation Commission has completed and published a new manual on "Plating-Room Controls For Pollution Abatement." Coordinator of the Committee for the Commission was J. E. Kinney, Sanitary Engineer of the Commission. Fifteen representatives from as many industries made up the action committee.

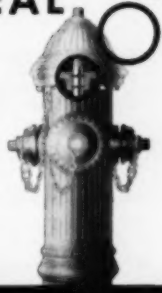
The bulletin-manual contains 20 pages and consists of seven sections. These sections deal with plating

"O" RING SEAL REPLACING CONVENTIONAL PACKING
1. BRONZE SLEEVED STEM 2. "O" RING DIRT SEAL 3. "O" RING PRESSURE SEAL 4. "O" RING SEAL PLATE
1
2
3
4

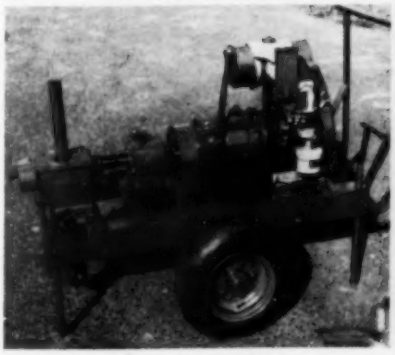
SMITH HYDRANTS
WITH "O" RING SEAL

"O" Rings replace conventional packing and reduce maintenance to a minimum. The lower "O" Ring is the pressure seal, the upper "O" Ring the dirt seal. The specially compounded rubber plastic "O" Rings do not deteriorate and insure a long life pressure seal.

All Smith Hydrants including Hydrants in service can be fitted with "O" Ring Seal Plates. Write for details.



THE A.P. SMITH MFG. CO.
EAST ORANGE, NEW JERSEY



GATE OPERATORS
—
PORTABLE
—
FOR STANDS & UNDERGROUND GATES—MOTOR TRUCK MOUNTED
PAYNE DEAN & CO.
CLINTON, CONN.

HOMOGENIZED
BOND-O
JOINTING COMPOUND

Machine Blended to Insure Utmost Uniformity

BOND-O's exclusive machine blending process brings you the one flawless self-caulking jointing compound. The finest basic materials obtainable are so thoroughly blended by the BOND-O process—that you are assured of absolute uniformity of performance from every bag you buy.

Northrop

NORTHROP & COMPANY, INC.
SPRING VALLEY, N. Y.

COLLECT SAMPLES
Automatically... Continuously!

Omega Sampler is a pump designed specifically for precision sampling in water, sewage, and industrial wastes plants.

FEATURES
Adjustable • Non-clogging
Positive displacement
Double pump head — collects two samples simultaneously
Renewable pump element • Corrosion resistant
Stainless steel mechanism

Whether you're sampling water, wastes, sewage, slurries, or process liquids, Omega Sampler will do the job accurately, dependably, automatically.

For complete information and Bulletin 67-N1A, Address Omega Machine Company (Division of Builders Iron Foundry), 250 Harris Ave., Providence 1, Rhode Island.

OMEGA
THE LAST WORD IN FEEDERS

room controls, good housekeeping; reduction of dragout losses, effective rinsing, prevention of leaks and losses, salvaging solutions for further use, and disposal of baths that cannot be purified.

Copies of this manual may be obtained by writing E. J. Cleary, Exec. Dir. and Ch. Engr., ORSANCO, 414 Walnut St., Cincinnati, Ohio.

Automatic Regulating Valves

616

Spence Engineering Company, Inc., Walden, New York, has just issued a bulletin featuring **Spence Pilot-Operated Regulating Valves.**

The bulletin contains a large cutaway illustration of the valve with detailed explanations of the five design features. In addition, a panel is devoted to showing how the control function of a Spence Regulator can be changed by using a different sensitive pilot.

Alternators for Changing Starting Sequence

617

Automatic Control Company, St. Paul, Minn., has announced a new bulletin covering **Autocon Alternators.**

The bulletin describes the Alternators and states that they do more than just automatically transpose starting sequence of any two pumps, compressors, blowers, burners, or units controlled by magnetic starters or two wire circuits. Illustrated and described is the feature which provides locked-in stand-by protection against a failure of the operating equipment, against failure of the pilot device, and against failure of the alternator unit itself.

Typical specifications and a list of Autocon representatives complete the bulletin.

Booklet on Latest Laboratory Apparatus and Techniques

618

Fisher Scientific Co., Pittsburgh, Pa., has available copies of **The Laboratory,** describing the latest developments in laboratory apparatus and technique.

Among the new items described and illustrated in the 32-page pocket-size journal are a new Titrimeter for fast, easy Karl Fischer, micro and other titrations; the first permanently-marked thermometers; a self-zeroing burette; and a photomultiplier attachment that increases the "DU" Spectrophotometer's sen-

LEADITE
The Pioneer Self Caulking Material for C. I. Pipe

TABLE OF COMPARATIVE QUANTITIES

Nominal inside dia. of pipe, in.	Depth of Joint, in Inches of Leadite	Approx. lbs. of Leadite per Joint	Depth of Joint, in Inches of Lead	Approx. lbs. of lead per Joint
4	2.5	2.00	2.25	8.56
6	2.5	3.00	2.25	11.71
8	2.5	4.00	2.25	14.63
10	2.5	5.00	2.25	17.70
12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
36	2.75	19.00	2.50	77.96
48	3.50	30.00	3.00	121.15
54	4.0	38.00	3.00	135.60
60	4.0	42.00	3.00	150.70

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

WILKINSON LINE LOCATOR
The original—the pace setter

Built to QUALITY
strict standards
Choice of discriminating buyers everywhere
Buy Satisfaction —not 'first cost'

Get the facts first

Locates all parts of your underground system

WILKINSON PRODUCTS CO.
3987 Chevy Chase Drive
Pasadena 3, California

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

sitivity several hundred percent. A little "one-hand" pinchcock which permits a controllable flow through laboratory tubing is also discussed.

Record Retention and Destruction

619

Remington Rand Inc., New York, N.Y., has just published a brochure entitled **"A Basic Plan for Record Retention and Destruction"** to aid in the intelligent planning for disposition of records at the time they are created by destruction of useless records and the economical, safe storage of those that must be retained.

This 24-page handbook covers such subjects as Classification of Business Records, Efficient Record Handling Can Save Money, How to Organize a Retention Plan, Record Retention Can Start Today, How to Operate a Retention Plan and the Tools for Effective Record Retention. Included is a case history of a a record retention program of a large utility corporation.

Profusely illustrated, with actual reproductions of various forms used for record retention and destruction, the handbook contains a checking chart listing the various types of records, and the time element for their retention.

Limitorque Valve Operators

620

Philadelphia Gear Works, Inc., Philadelphia, Pa., has made available a catalog on **Limitorque Control.**

The catalog states that the Limitorque Automatic Control is an efficient, mechanically actuated device for the operation of valves and is made for operating valves up to 120 inches in diameter and for sluice gates up to 144 inches square.

Photographs of the different types of controls and assemblies are included along with dimensional drawings and lubrication instructions. The last 20 pages of the catalog contain photographs of actual installations and the operations performed by the Limitorque Controls.

Two New Wheel-Type Ditchers

621

Gar Wood Industries, Inc., Wayne, Michigan, has just published two new catalogs describing the **Buckeye Model 314** and **Model 303 Wheel Type Ditchers.**

The Model 314 catalog explains in detail the construction and oper-

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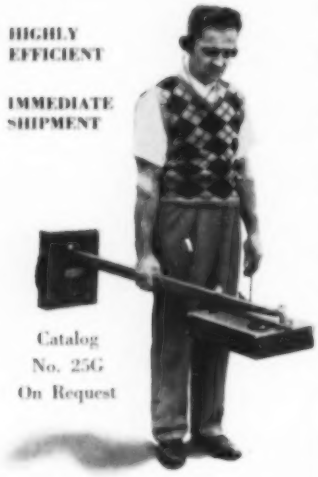

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ational features of this pipeline and utility ditcher which features a fluid coupling for more efficient power transmission and longer service life through cushioning of shock. Other features of the Buckeye 314 described, are the hydraulic digging wheel hoist, one-piece digging rims with variable bucket spacing, flexible-type gear traction drive, and a transmission which working with the fluid coupling provides an infinite range through eight forward and two reverse digging speeds, four roading and six conveyor belt speeds.

The 303, a versatile, medium utility ditcher, features ease of accurate operation, efficient power transmission, and has a split torque type conveyor drive with one-piece digging rim designed for variable bucket spacing.

Large photographs of each ditcher are shown along with description of essential working features.

Control Selection Bulletin

622

General Electric Co., Schenectady, N.Y., has just made available a new 8-page selection guide for a wide range of **Electric and Electronic Controls,** devices, and accessories.

The bulletin contains quick-reference selection data, photographs, and listings of additional publications which give complete information on each piece of equipment.

Products included are: manual, magnetic, combination, and reversing motor starters; pushbutton stations; relays; limit switches; solenoids; photoelectric relay; elctronic timer; electronic relay; pressure and vacuum switch; float switch; pressure governor; reduced-voltage starter; Thy-mo-trol drive; and smoke density indicator and control.

Pneumatic Conveyors for Bulk Treatment Chemicals

623

Dracco Corporation, Cleveland, Ohio, has published a 24-page bulletin on **Bulk Materials Handling with Dracco Airsteam Pneumatic Conveyors.**

The bulletin contains photographs and drawngs of actual installations in various industries. Page seven shows a conveyor installation at the city of Adrian (Michigan) water works, and how bulk water treatment chemicals, received by railroad car, are unloaded by Airsteam system to the head house. There, the materials are discharged by the

ROTO-TROL 940

Installations of *Roto-Trol 940* are in constant operation in all parts of the country. In each plant, they are controlling pumps, valves, and/or alarm circuits, etc., from one float. Many installations have several starting and stopping positions, both rising and falling. Each circuit is independent. Mercury switches with snap action are used. *940* can be set on the job.

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If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Dracco receiver into system-interlocked mechanical conveyors which move them to storage bins. As explained by the bulletin, the material is moved over a bridge, then underground from the rail siding to the storage building, which is 1100 feet away.

Descriptions of the lines, locks, pumps, motors and accessories to the conveyors are also included.

Electric Power Drives

624

Sterling Electric Motors, Inc., Los Angeles, Calif., has just published a new 20-page catalog of **Sterling Electric Power Drives.**

This well-illustrated catalog contains complete descriptive information on variable speed drives, geared motors and constant normal speed motors in drip-proof, splash-proof, totally enclosed and pipe ventilated designs.

Bulk-Flo Conveyors and Elevators

625

Link-Belt Company, Chicago, Ill., has just published a booklet on **Bulk-Flo Conveyors and Elevators.**

This 28-page booklet contains photographs of the Bulk-Flo in a wide variety of applications, together with typical layout drawings, engineering data, calculation tables, charts and formulas. Over 150 materials are analysed for average weight and such characteristics as size, flowability and abrasiveness.

The Link-Belt Bulk-Flo conveyor was developed for the mechanical handling of a great variety of bulk flowable materials—ganular, flaky, crushed, ground or pulverized.

Pictures and diagrams illustrate the Bulk-Flo's design flexibility. It is said to be adaptable to many combinations of paths, including L-paths and vertical run-arounds.

Mechanized Customer Accounting

626

International Business Machines Corp., New York, N.Y., has just published a booklet on **IBM Accounting for Electric, Gas and Water Utilities.**

The booklet describes how the electronic tube is teamed with a simple pencil mark to originate records in this application of IBM's equipment. The machine is said to cover such variables as: different services and rates; types of territory served; number and kinds of cus-

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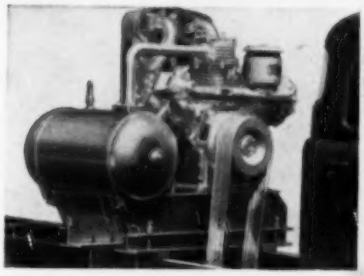

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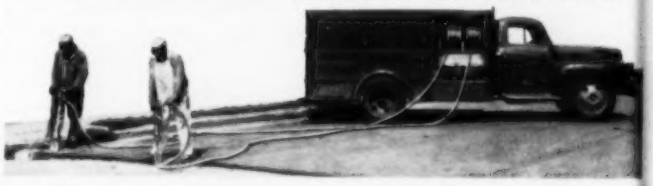

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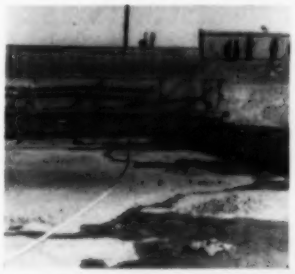

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tomers; and regulatory requirements.

The booklet also explains how service order preparation, meter reading, revenue accounting, bill preparation, remittance accounting, cash posting, and accounts receivable control, are handled on the machine.

Controller Bulletin

627

Foxboro Company, Foxboro, Mass., has just issued a 32-page bulletin describing the eight types of the **Model 40 Controller.**

The bulletin describes the Single Action, Dual, Duplex, Auto-Selector, Ratio, Relation, Pneumaticset and Time Schedule types. Attractively produced in colors, the bulletin contains 114 illustrations and diagrams, helpful in understanding and applying the advanced principles of automatic control. Each instrument is pictured with a typical process diagram and a characteristic chart record.

Stilcok Process for Distillation of Sewage and Garbage

628

Stilcok Co., Pasadena, Calif., has published a bulletin on **Stilcok Apparatus, Process and Plant Layout for Distillation of Carbonaceous Materials.**

The bulletin states that Sewage may, by distillation, be made to yield sufficient fuel values to cover the cost of disposal in an entirely odorless, sanitary, sterile and economical manner. Garbage, by the same method, can be made to yield vegetable oils, animal fats, alcohol, fuel gas and several hundred pounds of char residue often of higher carbon value per pound than coal or coke.

Diagrams show the operation of the Stilcok Stil, a ground plan of a Stilcok plant, and a cross sectional elevation of the plant. The operation of a Stilcok plant in conjunction with a sewage plant is also discussed. A chart showing the various carbonaceous materials and distillation results from garbage and sewage completes the bulletin.

Centrifugal Pumps

629

Morris Machine Works, Baldwinsville, New York, has made available a 4-page, 2-color folder on **Morris Centrifugal Pumps.**

The folder pictures the complete line of Morris pumps and descriptive text gives details as to the exact function of each pump. The NC pumps for handling sewage and refuse with large solids content are also covered in the folder. A list of Morris representatives are shown on the back page.

Screenings and Sludge Shredders

630

Gruendler Crusher & Pulverizer Co., St. Louis, Missouri, has available a bulletin titled **"Efficient Sewage Treatment."**

The bulletin discusses Gruendler's Screenings Shredder, Garbage Grinder and Dry Sludge Shredder. Photographs shows the equipment and actual installations. Cross-section drawings are included to show different methods of installing shredders. Under each piece of equipment, complete specification charts are shown.

Large Capacity Elevated Steel Tanks

631

Chicago Bridge & Iron Co., Chicago, Ill., has just issued a 24-page booklet, **"Horton Elevated Steel Tanks of Large Capacity,"** describing the advantages of using large elevated steel tanks to provide gravity pressure in municipal water works systems.

The booklet contains detailed information on the design and construction of Horton Radial-Cone elevated tanks which are built in capacities from 500,000 to 3,000,000-gallons and Hortonspheroidal elevated tanks built in sizes from 1,000,000 to 3,000,000-gallons.

Included in the booklet are twelve photographs of actual installations, 3 of which are in full color, a table of sizes, and a page of drawings showing construction details.

Large, Complete Catalog of Laboratory Equipment

632

Kewaunee Manufacturing Company, Adrian, Mich., has made available the complete 128-page **Kewaunee Metal Scientific Laboratory Equipment** catalog.

The catalog, amply illustrated with photographs of over 300 pieces of equipment and 29 photographs of actual installations, goes into considerable detail on exactly how Kewaunee equipment is built. Photographs also show the various manufacturing divisions in operation in the plant.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Featured in the catalog are: Table Tops, Desk Tops and Counter Tops; Standard Metal Units; Laboratory Cases, Service Fittings and Sinks; Traps and Drain Fittings; Specialized Laboratory Appliances; Laboratory Electric Fittings; Industrial Laboratory Equipment; Mechanical Ventilation; Laboratory Flume Hoods; Miscellaneous Laboratory Equipment; Automatic Adjustable Chairs and Stools; and Educational Laboratory Equipment.

Floatless Liquid Level Controls

633

B/W Controller Corporation, Birmingham, Mich., has just published a comprehensive booklet on **B/W Floatless Liquid Level Controls.**

This attractive 36-page booklet discusses the history of all-electric floatless controls and states that they are ideally suited for control of any liquid which is a conductor of electricity. They can be used for pumping or valving operations, single or multiple signalling operations, flow controls, and many other specialized types of liquid level control. Multiple pump controls, starter and relay combinations, and combination multiple pump controls are but a few of the many subjects covered by this booklet.

Handbook for Care of Centrifugal Pumps

634

Yeomans Brothers Co., Chicago, Ill., has published, in conjunction with Allis-Chalmers Manufacturing Co., a **Handbook for Care of Centrifugal Pumps.**

This complete 16-page, 2-color handbook applies to all makes of centrifugal pumps and covers the following subjects: The how and why of pump construction—how they affect pump maintenance; How a change in liquid can blitz a pump; Which way suction piping should slope—and why. Tips on easy ways to find leaks; Common mistakes in packing stuffing boxes; Quick diagnosis of pump ills—symptoms, causes, proven cures; New maintenance timetable; How tight is "too tight" for a gland?; Little known facts about cavitation, how to protect pumps against it; and The vital role of water as a lubricant in pumps.

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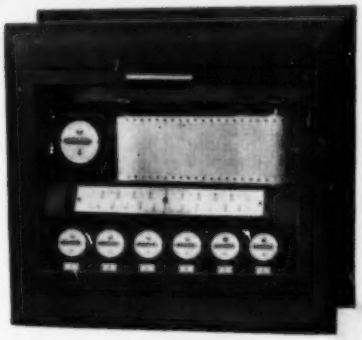

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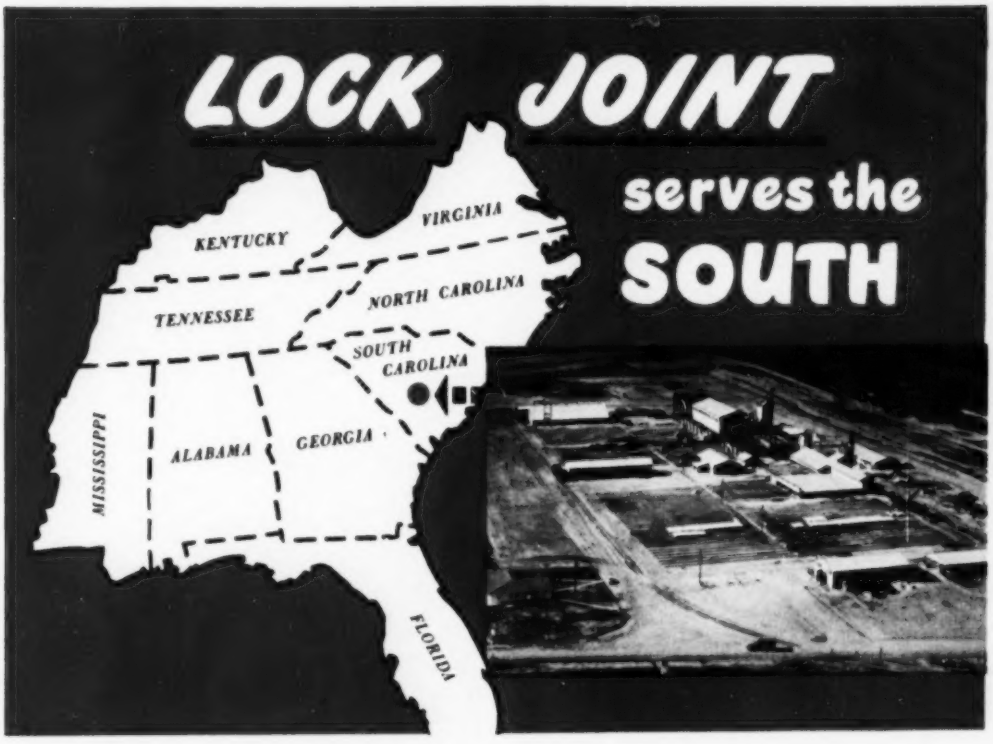

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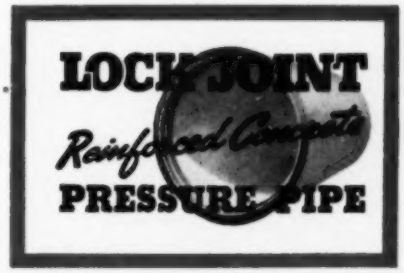

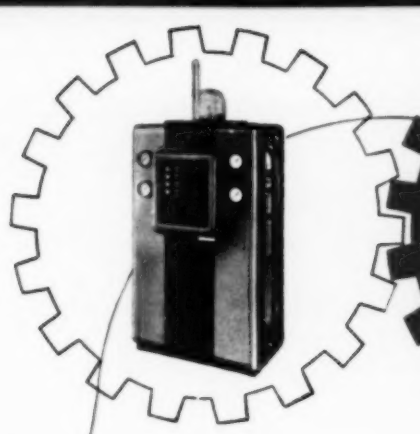

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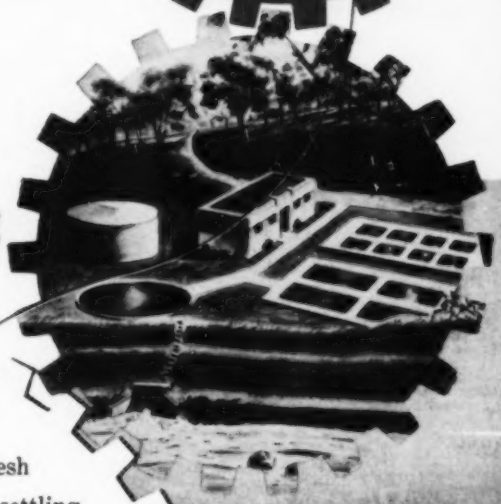

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